Unfolding the conceptualisation and measurement of ambivalent attitudes

Joshua A. McGrane

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School of Psychology
University of Sydney
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When I started this PhD, I certainly did not envisage the trials and tribulations I would face. The course of the last 5 years has involved some of the highest highs and lowest lows, at times simultaneously, which is only fitting for a thesis concerned with ambivalence. One feeling I am definitely not ambivalent about is my sincere thanks for the many people that have contributed, in one way or another, toward this dissertation.

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Abstract

In the last two decades, ambivalence has emerged as one of the primary concerns of attitude researchers. The acknowledgement that individuals can simultaneously evaluate an attitude object as both positive and negative has challenged a number of the status quos of the attitude literature. This thesis utilises an unfolding approach to investigate the implications of ambivalence for the conceptualisation of attitudes and their measurement.

Firstly, the assumption that ambivalence is at odds with the bipolar understanding of attitudes was investigated. The results suggested that ambivalence is consistent with bipolarity, whereby ambivalent attitudes are located at the centre of the bipolar dimension. Secondly, attitude scales for the abortion, euthanasia and Aboriginal Australians issues were constructed to reflect this bipolar understanding. The fit of these statements to Coombs’ (1964) unidimensional unfolding theory provided evidence that ambivalence is also consistent with the quantitative conceptualisation of attitudes. Together these results provided further validation of the unfolding approach to attitude measurement. These models alleviate many of the problems faced by the ubiquitous method of summated ratings, including the assessment of ambivalent evaluations.

Finally, these scales were used to investigate the latent structure of attitudes and its relationship with meta-psychological judgements of ambivalence. The conclusions drawn from these analyses were limited by a number of issues, highlighting the importance of rigorously considering measurement issues for all attitude parameters. Nonetheless, they presented preliminary validation of these scales’ ability to measure ambivalent evaluations and suggested a systematic
relationship between proximity to the centre of the evaluative dimension and meta-psychological ambivalence.

Overall, it is concluded that a number of assumptions regarding the implications of ambivalence are misplaced and the proposed solutions are even more troublesome. Suggestions for future research are made, particularly with respect to differentiating between ambivalent, indifferent and uncertain evaluative states. Furthermore, attitude researchers are encouraged to discard their operationalist biases in order to engage with the measurement issues illuminated throughout this thesis. This is necessary to account for the complexity of the attitude construct, which ambivalence is testament to.
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Chapter 1 - An introduction to attitudes, ambivalence and their measurement

1.1 Introduction

The attitude concept has a rich history. In fact, a recent PsycINFO keyword search revealed 197,950 matches for this term over the last century. That is an average of approximately 38 publications per week. It is little wonder, therefore, that Allport (1935) described it as the most fundamental concept in social psychology. Despite its ubiquity and longevity a number of problems remain unresolved. This thesis will examine ambivalence and its implications for our understanding of attitudes. Ambivalence brings into question some of the most invariant factors in the conceptualisation and measurement of attitudes. Specifically, the assumptions that attitudes are bipolar and quantitative constructs (Cacioppo, Gardner & Berntson, 1997; Michell, 1990, 1994; Thompson, Zanna & Griffin, 1995).

With respect to the assumption of bipolarity, the positive and negative elements of individual’s attitudes have typically been approached as reciprocally related (Cacioppo et al., 1997). In this sense, the attitude continuum since the time of Thurstone (1928) has been presented as ranging from various degrees of positivity to various degrees of negativity with ‘neutral’ standpoints in-between. Typically, ‘Neutral’ attitudes have been approached as the absence of any evaluation, or what is termed indifference (Cacioppo et al., 1997).

Such a conception seems intrinsically sensible, as many such dichotomies exist around us in every day life (Thompson et al., 1995). The layperson and
psychologist alike tend to think in terms of good versus evil, liberal versus conservative, hot versus cold. However, over the past decades a number of theorists have disputed this understanding, as they believe it ignores attitudinal ambivalence (Cacioppo & Bernston, 1994; Kaplan, 1972; Scott, 1966; Thompson et al., 1995).

Ambivalence is the phenomena whereby an individual evaluates an attitude object as both positive and negative or may feel both for and against some issue (Conner & Armitage, 2008). It seems unlikely that any individual has not felt torn or conflicted toward some issue at one point in time. When evaluating social issues individuals are typically faced with a large amount of competing information or interests and these can result in ‘mixed’ evaluations. Typically, it is attitudes toward these sorts of issues that social scientists are most interested in.

In fact, ambivalence has been identified as a crucial moderator in a number of attitude-related issues including the attitude-behaviour and attitude-intention relationships (Conner & Sparks, 2002; Sparks Harris & Lockwood, 2004). Additionally, Jonas, Bromer and Diehl (2000) demonstrate the importance of the consideration of ambivalence in the study of attitude change. At a more fundamental level, the emergence of ambivalence has led to the reassessment of the nature of attitudes (Sparks et al., 2004). Ambivalence appears to be a very real and important phenomenon and therefore any theory of attitudes and their assessment must account for it (Thompson et al., 1995). Thus, whether ambivalence fits with a bipolar understanding of attitude must be investigated.

Furthermore, attitude researchers have been guilty of what has been described as a ‘pathological’ preoccupation with the concept of measurement (Michell, 1999). This preoccupation has lead to the subversion of the concept as it is conceived in the natural sciences, and resulted in the widely held belief that quantitative structure is
something that can decided by the researcher. When one talks of measuring some thing, one is in fact speaking of a process whereby the measurer attempts to approximate the empirical properties/relations of that thing. By this understanding, quantitative structure is a property of something belonging to the spatio-temporal world and not something that can be artificially imposed (Michell, 1990). Hence, the assumption that attitudes are quantitative is in fact an empirical hypothesis and must be critically tested (Haack, 1993).

Consequently, given the importance of these issues for the attitude concept and its use in social psychology, this thesis will attempt to clarify the implications of ambivalence for the bipolar understanding of attitudes. Furthermore, it will attempt to reconcile the measurement of ambivalent attitudes with the traditional theory of measurement. This chapter will introduce and overview the key concepts of attitude, particularly attitudinal ambivalence, and measurement, specifically with respect to the measurement of ambivalence.

1.2 What is an attitude?

Throughout the history of the attitude concept there have been recurring debates regarding its definition (see Eagly & Chaiken, 1993; Fazio, 1995; Gawronski, 2007; Zanna & Rempel, 1988;). One of the most enduring theories is the Tripartite model proposed by Rosenberg and Hovland (1960), which postulates that there are distinct affective, cognitive and behavioural components of attitudes. This model subsumes the emphases of others such as Thurstone (1928) who defined attitudes as purely affective in nature, Heider (1946) and Maze (1973) who defined them as cognitive
evaluations\textsuperscript{1}, and Allport (1935) who generalised attitudes as psychological states of readiness to behave in a certain way. Whilst it seems sensible to suggest that affect, cognition and behaviour are all causally relevant to our evaluations, this model only provides a very general sense of what we mean by attitude and provides no explanation of how these various components come to influence and form our attitudes.

A stark illustration of the ongoing ambiguity in the definition of attitude is the recent dedication of an entire edition of the journal *Social Cognition* to this issue (see Gawronski, 2007). In this edition, Gawronski and Bodenhausen (2007) explicate an attitude model that despite still being in its formative stages promises to serve as a far more thorough account. This Associative-Propositional Evaluative (APE) model, as the name suggests, distinguishes between two forms of evaluations, the associative and the propositional. Associative evaluations are characterised as the affective reactions resulting from the associations automatically activated when one encounters an attitude object (Gawronski & Bodenhausen, 2006). Crucially, these associations do not possess any truth entailment. For example, an Australian visiting North America for the first time is likely to encounter many African Americans whose appearances are consistent with the stereotype of gang member, which they have been exposed to viewing American films and television shows. Under this model, such an encounter would lead to the automatic activation of the associations learnt from these mediums such as crime, firearm possession, intimidatory behaviour etc., which may in turn lead to the affective reactions of increased heart rate, increased breathing rate and intense feelings of fear. The activation of these

\textsuperscript{1} Maze (1973), in fact, referred to them as a form of pseudo-cognition as they relate to pseudo-properties of an object, e.g., the property of ‘goodness’.
associations and the experience of these affective reactions may come about irrespective of whether the individual believes them to be a valid response.

Propositional evaluations, on the other hand, are cognitive in nature and dependent upon propositional reasoning processes (Gawronski & Bodenhausen, 2007). The model assumes that the spontaneous affective reactions are translated into an evaluative propositional form and this proposition is then subjected to syllogistic inferences to assess its truth. The assessment of its validity is dependent upon its consistency with other propositions that are deemed to be relevant to the judgement in that particular moment. This validation process leads to a final evaluative judgement. For example, the abovementioned negative affective reaction to the African American person may be translated to the evaluative proposition ‘I dislike African American people’. This is then compared with the non-evaluative proposition that, ‘American film and television misrepresents African Americans’ and the evaluative proposition that, ‘it is bad to judge people based upon media misrepresentations’. If both of the latter propositions are accepted as true, then the affective reaction will be rejected as a basis for a final evaluative judgment. However, if either of these latter propositions is deemed to be false, then the affective reaction may be consistent with the final evaluative judgement [NB. Although this example depicts this process as a conscious one, in many cases it will not be (Gawronski & Bodenhausen, 2006)].

Whilst this model contains a number of shortcomings, such as its lack of explanation of how the associations activated by an attitude object transform into an affective reaction and in turn how this manifests into a propositional form, it integrates and explains a number of findings and shortcomings in the recent attitude literature (Gawronski & Bodenhausen, 2006). These include accounting for both
implicit attitudes, treated as synonymous with associative evaluations, and explicit attitudes, interpreted as synonymous with propositional evaluations (Gawronski & Bodenhausen, 2006; Greenwald & Banaji, 1995). It provides explanations of attitude change at both the explicit and implicit level that are supported by the existing evidence (Gawronski & Bodenhausen, 2007). Furthermore, it resolves the controversy of whether attitudes are stable, enduring dispositions or context dependent constructions as either perspective is consistent with the model (Gawronski & Bodenhausen, 2007; Schwarz, 2007).

Crucially for this thesis, given the independence of the affective and propositional systems under this model, it provides justification for an examination of the cognitive/propositional component of attitudes independently of the affective/associative component. Henceforth, for simplicity, this thesis will focus upon attitudes as cognitive constructs and the term will be used to refer to an evaluative judgement (Gawronski & Bodenhausen, 2007). It should be noted that this definition goes beyond the typical cognitive understanding of attitude, such as Maze’s (1973), as an evaluative belief. The evaluative judgement is a special case of an evaluative belief, which necessitates a process of subjective validation.

This is an important distinction to make as a person may stand in a certain evaluative belief relation, but it should not be considered an attitude unless it is deemed subjectively valid. For example, I may be aware of the evaluative belief that, ‘blue-vein cheese tastes good’, but this cannot be considered my attitude unless I endorse it as true based upon its consistency with my other beliefs.

This point also relates to a major departure this thesis will take from the APE model. Gawronski and Bodenhausen (2006) argue that the propositional reasoning processes underlying the evaluative judgement are chiefly concerned with cognitive
Propositions are taken to be consistent with one another when they are both deemed subjectively true and one does not entail the opposite of the other. Such a view leads them to reject the possibility of an ambivalent evaluative judgement, as by definition ambivalence is the endorsement of mutually opposing evaluative propositions. Interestingly, this aspect of the APE model reiterates a bias in the literature that lead to the ignorance of ambivalence in attitude literature for decades (Thompson et al., 1995). A refutation of this aspect of the model will be provided, but firstly it is necessary to overview the history and the definition of the ambivalence concept in psychology.

1.3 What is ambivalence?

The psychological phenomenon of ambivalence has a long history in modern academic psychology and it is testament to the complexity of the human cognitive and affective systems. The term was first introduced in the work of Bleuler (1908, cited in Meerloo, 1979) and was adopted by Freud (1998) and his psychodynamic successors who used it to describe the conflict between the repressed instinctual forces and the internalisations of the prohibitions of such forces.

It has also played a central role in the theories of the development of infant attachments and intimate adult relationships, particularly with respect to the tripartite classification of infant attachment styles which include the anxious-ambivalent classification (Ainsworth, Blehar, Waters, & Wall, 1978). In this context, ambivalent style refers to infants who become quite distraught when their parent leaves the room and show no reassurance or comfort when the parent reenters the room. They are ambivalent in the sense that they desire the parent in the room before departure and
reject their presence in the room upon reentry. Intriguingly, despite the fact that concepts of ambivalence were playing central roles in such areas of psychology throughout the 20\textsuperscript{th} Century, it remained mostly ignored in the attitude domain until very recently (NB. exceptions to this include: Diab, 1967; Green & Goldfried, 1965; Kaplan, 1972; Klopfer & Madden, 1980; Moore, 1973; Scott, 1966).

Ambivalence emerged as a priority in the attitude domain predominantly through the publication by Thompson et al. (1995), which implored attitude researchers to care about the issue when constructing their theories and measures. This was bolstered by the earlier publication of Cacioppo and Bernston (1994), which put forth a bivariate structural model of attitudes that accounted for both attitudinal ambivalence and indifference. By the beginning of the 21\textsuperscript{st} Century, ambivalence had firmed as a fundamental consideration of attitude research (Conner & Armitage, 2008; Conner & Sparks, 2002).

The ensuing research has identified a number of sources of attitudinal ambivalence including conflicting affective reactions whereby an individual may feel both positive and negative affect toward an object at the same time (Larsen, McGraw & Cacioppo, 2001). It has been found to stem from conflict between affective reactions and cognitive evaluations (Maio, Esses & Bell, 2000). For example, a shark-loving person may have conflicting affective reactions (e.g., extreme fear) to, and cognitive evaluations (e.g., ‘I believe they are good animals’) of sharks the first time they scuba dive with them. Priester and Petty (2001) found that ambivalence may also be caused by perceived evaluative conflict between yourself and significant others in your life. Of most relevance to the current research is the finding that ambivalence may come from conflict between cognitive evaluations whereby an individual may evaluate an attitude object as both good and bad (Conner et al.,
2002). As this thesis is focusing upon attitudes as evaluative judgments, it will use the term ambivalence to refer to the conflict between evaluative propositions, which manifest in to an evaluative judgement that is both positive and negative.

As alluded to earlier, this view of ambivalence is at odds with the APE model, which postulates that conflict between evaluative propositions is psychologically untenable. Gawronski and Bodenhausen (2006) argue that this conflict must be resolved by the invalidation of one of the conflicting propositions, which would preclude the emergence of an ambivalent evaluative judgement. This aspect of their theory is heavily influenced by Festinger’s (1957) cognitive dissonance theory, which argues that humans find any level of cognitive conflict inherently uncomfortable and hence are motivated to resolve this conflict by modifying one of the beliefs or acquiring a new belief.

Although there is great deal of empirical support for cognitive dissonance theory, a number of studies have failed to support the central assumption that discomfort necessarily follows from cognitive conflict (Harmon-Jones & Mills, 1999; Newby-Clark, McGregor & Zanna, 2002; Zanna, Lepper & Abelson, 1973). Gawronski and Bodenhausen (2006) make another questionable assumption that cognitive consistency, “results from a propositional process of consistency assessment that is based on the assignment of truth values and the application of syllogistic rules and logical principles” (p. 695). They do contend in a footnote that, “logical consistency is intended to refer more broadly to subjective consistency resulting from any kind of inferential rule that is considered to be valid, rather than to strict logical consistency in terms of normative syllogistic rules” (p. 695). Thus, although formal logic would preclude the acceptance of two propositions that entail a contradiction, e.g., ‘Chocolate cake is good’ and ‘Chocolate cake is bad’, the onus is
upon Gawronski and Bodenhausen to demonstrate that this applies to the subjective inferential rules referred to in their footnote. Particularly as research has demonstrated that individuals routinely feel ambivalent in their food attitudes as well as many others (Urland & Ito, 2005).

A similar subjective interpretation is made with respect to their notion of ‘truth values’ (Gawronski & Bodenhausen, 2006). The reason why the ‘truth’ of an evaluative proposition must be viewed as subjective is made clear by Maze (1973). He argues that evaluative propositions do not refer to factual properties. For example, when one thinks, ‘this chocolate cake tastes good’, they are not referring to any actual ‘goodness’ property of the cake. Hence, the truth of this proposition is rendered subjective. Given this subjectivity, the truth of an evaluative proposition does not logically entail the falsity of its contradiction. In fact, it seems perfectly reasonable that I assign truth-values to both the proposition, ‘Chocolate cake is good’, as I enjoy its taste, as well as its contradiction, ‘Chocolate cake is bad’, as I am not fond of its effect upon my waistline.

Furthermore, the above example is not intended to suggest that ambivalent evaluative propositions can only be accepted as subjectively true if they are considered relevant to different dimensions of the object, i.e., taste vs. calorie content of a chocolate cake. It seems reasonable to assume, given the subjective nature of the consistency assessment, that I may accept two contradictory propositions with respect to a single dimension of the attitude object. For example, I may judge that ‘I think the Prime Minister of Australia is doing both a good and a bad job with respect to economic management’. In this example the attitude object is the Prime Minister and the single dimension relevant to my judgement is his/her economic management. This judgement may have come about, as I believe his/her approach to budget
surpluses was good, as he/she consistently kept the federal budget in surplus, and I believe his/her approach to budget surpluses was bad, as his/her chosen level of surplus was not sufficient to alleviate the pressure of rising inflation on interest rate levels. Whilst the two evaluative propositions are contradictory, the non-evaluative propositions underlying them appear perfectly reasonable bases to subjectively validate both as true.

It appears that this aspect of the APE model is influenced by an antiquated view that cognitive processes are rational in a sense akin to formal logic. These intuitive examples as well as the vast number of published studies, which suggest that individuals are commonly conflicted in their evaluations of issues, suggest that this assumption of Gawronski and Bodenhausen’s (2006) model should be abandoned. This thesis will provide further evidence by examining individuals’ ambivalence specifically with respect to conflicting evaluative propositions. As previously discussed, this part of the APE model is attributable to the influence of cognitive dissonance theory. Interestingly, Thompson et al. (1995) identified the influence of this seminal theory as a major contributor to the ignorance of ambivalence in attitude research for much of the 20th Century.

1.4 Why has ambivalence been ignored?

Cognitive dissonance theory argues that we are intrinsically motivated to resolve conflict between evaluative propositions and thus states of evaluative conflict are interpreted as transient and of little psychological interest. Due to the extremely influential nature of this theory, the antecedents and consequences of cognitive consistency were the focus of research and ambivalence was reduced to a form of
cognitive error (Thompson et al., 1995). This perspective would have undoubtedly influenced our measurement instruments, which would have been designed to assess more permanent states. However, the effect of our measurement instruments in subverting ambivalence was apparent well before the emergence of cognitive dissonance theory. This subversion coincided with the emergence of the method of summated ratings as the mainstream approach. The fact that no other ambivalence researcher has made the same observation is testament to the strong grip this methodology has over attitude research.

The measurement of attitudes began with Thurstone (1928) with his pioneering paper extending the experimental methods of psychophysics to the study of attitudes (Cacioppo & Berntson, 1994; Michell, 1990). His method first requires the construction of a measurement scale consisting of statements spanning the attitude continuum from varying degrees of positivity through what he termed ‘neutrality’ to varying degrees of negativity. Examination of the sort of statements Thurstone (1928) put forth as constituting the ‘neutral’ section of the continuum reveals that he considered both ambivalent and indifferent attitudes (Andrich & Styles, 1998). Examples of such statements toward the issue of capital punishment include; (1) "capital punishment gives a criminal what he deserves", (2) "I think capital punishment is necessary but I wish it were not", and (3) "capital punishment is one of the most hideous practices of our time." Statement 2, in particular, demonstrates Thurstone’s (1928) consideration of ambivalent attitudes in his approach as it clearly expresses conflicting evaluations of the issue.

Likert (1932) developed his method of summated ratings in response to the laborious procedures required by Thurstone’s (1928) approach. His technique did not require the time-consuming prior step of scaling attitude items as participants were
simply given a large collection of clearly negative or clearly positive statements to respond to on an arbitrary, graded disagree-agree scale. Respondents’ attitude measures are therefore calculated by summing the values of agreement given to each statement, with the negative items reverse-scored. Likert (1932) claimed his technique to be superior as it was much simpler, more reliable and the results were highly correlated with Thurstone’s (1928). Such properties have undoubtedly contributed to the widespread appeal of this method to the point where one will scarcely find an attitude study that does not implement it in some form.

However, an unfortunate property of this method is that it is unable to capture ambivalent attitudes. For example, an ambivalent item, such as Statement 2 above, cannot be included in a Likert-type questionnaire, as it is unclear whether one should score it positively or negatively (Andrich & Styles, 1998). Likert (1932) and his successors have attempted to overcome this inability to include ‘neutral’ items by including a ‘neutral’ middle-category in the response scale. However, repeated research has demonstrated that such a middle-category only further complicates interpretation of the results, as it does not distinguish between individuals who utilise it because they are ambivalent, indifferent or uncertain toward the issue (Andrich, De Jong & Sheridan, 1997; Dubois & Burns, 1975; Klopfer & Madden, 1980).

Kaplan (1972) was the first to acknowledge that for ambivalence to re-emerge as a major issue in attitude research, reformation of the existing measurement approaches was necessary. His solution was to reformulate the semantic differential scale, an alternative form of rating scale to Likert’s (1932), so that respondents reported their positive and negative feelings toward an object on separate scales. These separate positive and negative scores were then combined to give an ambivalence ‘measure’. Drawing upon this approach, a number of researchers have
developed their own ambivalence measures, e.g., Thompson et al. (1995) and Priester & Petty (1996). An overview of the qualities of these approaches will be provided, but this must be done in light of an understanding of the true meaning of measurement. Whilst at face value this may appear an unusual statement to most psychologists, the proceeding section will make it increasingly clear why this is a central issue to any thesis concerned with psychological measurement.

1.5 What is measurement?

Implicit within all major theories of attitude measurement is the assumption that attitudes are quantitative (Michell, 1990, 2004a). This assumption is driven by the quantitative imperative of academic psychology, which is the view that a scientific understanding of one’s subject matter is only provided by measurement (Michell, 2003). Given that one can only measure quantitative variables, it is important for the attitude researcher that attitudes are quantitative. The fact that quantitative structure is something that should be discovered by the researcher continues to go unnoticed by psychologists despite numerous reminders (Michell, 1990, 1997, 1999, 2001a, 2004a, 2006, 2009). This is attributable to the field’s distortion of the concept of measurement.

The definition of measurement in psychology is quite distinct from the understanding of other sciences. Psychology’s definition was introduced by Stevens (1946) and usually takes the form, ‘the assignment of numerals to objects or events according to rules’ (p. 677). Henceforth, the immediate problem of measurement is not whether psychological variables are in fact measurable, but rather the specification of the rule used and the mathematical properties of the resulting scale.
By the latter, he meant the specification of the level of the measurement according to his now widespread classification, i.e., nominal, ordinal, interval or ratio level. The motivations for Stevens’ redefinition are an intriguing episode in the history of psychology and vary from the defence of his own ego to the understanding of measurement in the philosophy of mathematics (Michell, 1999).

In 1932, the British Association for the Advancement of Science came together to debate, amongst other things, the status of measurement in psychology. In their final report there was relative agreement that psychology had not yet developed true measurement scales. A particular focus of their criticism was Stevens’ (1934) own ‘Sohn scale of loudness’, which alleged to measure the subjective magnitude of an auditory sensation. It is clear from his 1946 paper that Stevens took this rather personally and led him to claim that the meaning of measurement was reducible to a “semantic issue”, and that we should “recognize that measurement exists in a variety of forms” (p.677).

These two claims point to the contentious aspects of Stevens’ definition. Firstly, to talk of measurement as involving the assignment of numerals really does reduce it to a semantic issue. One can assign numerals for a multitude of reasons beyond the scope of measurement, e.g., the assignment of numerals to the jerseys of different football players. This is because numerals are man-made symbols whose meaning is ascribed by us and thus may be arbitrarily utilised. Secondly, defining measurement as being possible by the application of a number of unspecified rules implies that there are a variety of forms of measurement, which is in stark contrast to the traditional view (Michell, 1990, 2007).

The traditional view stems from antiquity and the work of Euclid and explicitly underpinned scientific inquiry up until the 20th century (Michell, 2007). A
traditional definition of measurement would generally take the form, “the discovery or estimation of the ratio of a magnitude of a quantity to a unit of the same quantity” (Michell, 1999, p.222). For example, when I report a piece of string as 7cm long, I am saying that when I placed a ruler next to that piece of string I discovered that the magnitude of the length of this string was approximately seven times the magnitude of my chosen unit, the centimetre. Thus, the measure that I report for the piece of string is not a form of numerical assignment. It is the discovery of an objective property of the world, the discovery of number, which is the ratio between the quantities.

In contrast to the traditional view, Stevens’ definition is derived from the representational interpretation of measurement espoused by Campbell (1920, as cited in Michell, 2007) and Krantz, Luce, Suppes and Tversky (1971), which is the predominate view in the philosophy of mathematics (Michell, 2007). This view rejects any claim that numbers are objective properties of the world. Rather, it argues that the measurement of empirical quantities is possible because an isomorphism (one-to-one mapping) exists between their structure and a part of the abstract real number system. Thus, measurement is not entirely an empirical process of discovery as it necessitates the assignment of abstract numbers to empirical quantities. This was the starting point for Stevens’ (1946, 1959) argument as numbers can be assigned as long as a consistent rule specifying the isomorphic relationship is followed.

However, Bostock (1979, as cited in Michell, 1990) and Michell and Ernst (1996, 1997) provide proof that the ratios of values of a continuous quantity are identical in structure to the positive real numbers. Consequently, realist philosophers like Armstrong (1981), Michell (1990) and Newstead and Franklin (2008) argue that
these ratios are the positive real numbers and thus these numbers are properties of natural systems. Thus, when we measure we are discovering the numerical relationships between values of a quantity, and this is an empirical, not representational, exercise (Michell, 1990, 2008a).²

The debate regarding the realist versus representational interpretation of number continues. However, irrespective of whether the properties and relations of a quantity are isomorphic to, or instantiate, the positive real numbers, the numbers provided by our measurements refer to empirical properties. Thus, whether the rule specifying the isomorphic relationship accurately reflects the structure of the variable is an empirical question. The representationalist view does not change the fact that measurement is only possible when a variable’s structure permits the calculation of ratios between its magnitudes and a common unit.

Stevens’ (1946) reduction of measurement to rule-based numerical assignment is heavily influenced by operationism. This scientific doctrine argues that our scientific definitions of natural systems should be grounded in the operations we utilise to measure or manipulate them (Michell, 1999). The conceptual problems of operationism will be discussed in greater detail in Chapter 5, but the implication for Stevens’ approach is that the numerals allocated as a function of the operational rule chosen by the researcher define the properties we are trying to measure. However, under both the representational and traditional views, these numerals are a consequence of these empirical properties and thus cannot validly define them.

Despite Stevens’ best efforts to obscure the fact, there is only one rule of measurement and that is the traditional definition. Any other view is at odds with the paradigm of measurement in science and is more akin to applied numerics (Barrett, ₂

² A more detailed definition of quantity will be provided in Chapter 3
2003; Michell, 2008a). Therefore, attitude researchers cannot continue to mistakenly
believe that the existence of quantitative structure is a function of methodological
choice. Rather, if claims of measurement are to be made, the burden is upon us to
provide evidence that attitudes are quantitative.

Fortunately, Michell’s (1990, 1994) grafting of Coombs’ (1964) theory of
unidimensional unfolding to Luce and Tukey’s (1964) conjoint measurement theory
provides attitude researchers with the means to genuinely test this quantitative
assumption. There is a scientific imperative to do this, as only then will claims of
measurement as well as the interpretation of attitude scores be justified. Similarly,
any claims to measure ambivalence must be made in light of this hypothesis.
Unfortunately, as will be illustrated in the next section, existing methodologies for
the assessment of ambivalence perpetuate Stevens’ (1946) distorted view of
measurement. This thesis will be the first to explicitly address the quantitative
assumption in the context of assessing ambivalent attitudes.

1.6 The current approach to measuring ambivalence and its limitations

The most commonly utilised method of assessing ambivalence in the contemporary
attitude literature involves a reformulated rating scale procedure. This generally
involves splitting a bi-polar rating scale around the neutral point such that one is left
with two uni-polar scales, one to assess the positive and the other the negative ratings
of the attitude object (Kaplan, 1972). As can be seen in Figure 1.1 below, these two
unipolar scales imply the assumption that the independent positive and negative
dimensions of an attitude possess an interval/quantitative structure.
Figure 1.1. An example of a reformulated rating task representing the positive and negative dimensions as independent using two uni-polar, 5-point rating scales.

This approach has been argued to measure what has been termed ‘potential’, ‘objective’ or ‘operative’ ambivalence. This is because it is a relative feature of the positive and negative dimensions and does not require people to consciously reflect upon how conflicted their attitude is (Armitage & Arden, 2007; Holbrook & Krosnick, 2005; Priester & Petty, 1996). The ambivalence ‘measure’ is calculated by combining the positive and negative uni-polar ratings using a pre-determined formula and it is this formula that has been subject to the most scrutiny. An extensive overview of the different formulas can be found in Priester & Petty (1996). However, they will not be reviewed in this thesis as the Similarity-Intensity Model exemplifies their general properties (Thompson et al., 1995).
Thompson et al.’s (1995) Similarity-Intensity model (SIM) has received the most attention as an ambivalence formula. This model stipulates that ambivalence manifests in two ways. Firstly, it presents in the similarity between the positive and negative ratings. Secondly, it is revealed in the intensity of the respective ratings. Thus, the more similar your positive and negative judgements are and the more intense they are, the greater your potential ambivalence is. Similarity is assessed by calculating the absolute difference between the positive (P) and negative (N) ratings and intensity is assessed by averaging the positive and negative ratings. This conceptualisation is exemplified in the formula below:

\[ \text{Ambivalence} = \frac{(P + N)}{2} - |P - N| \]

Thus, ambivalence is equivalent to the intensity of the components corrected by the dissimilarity in their magnitude (Thompson et al., 1995). According to this approach, ambivalence increases in a linear manner, whereas other similarly premised models depict this increase as either positively or negatively accelerating (Priester & Petty, 1996).

A number of criticisms apply to these ambivalence formulas. Firstly, as all of these models rely upon a reformulation of the summated ratings approach, they are undermined by the problem of how to interpret the numbers obtained by this method. For example, if we take higher scores to indicate more positive attitudes and scores of ‘4’ and ‘2’ on the above positive rating scale, it is not apparent that a respondent who obtains a score of ‘4’ possesses an attitude that is either ‘2’ units greater than, or twice as positive as a person scoring ‘2’ (Davies, 2004). This is even further complicated if we make a similar assessment based upon the negative rating scale
and then combine scores across the two dimensions as the various formulations of ambivalence would have us do.

Similar to the method of summated ratings, this reformulation makes the assumption that the positive and negative substrates of attitudes are quantitative and provides no means of testing this assumption (Michell, 1994). Rather, it relies upon its operational ‘rule’ to determine that, firstly, the positive and negative dimensions are independent, and secondly, the two dimensions are quantitatively structured. However, as discussed in Section 1.5, the measure cannot be used to define these properties.

To be scientifically credible, the researcher must provide evidence that these are properties of attitudes and in turn corroborate how their measure causally reflects these properties (Borsboom, 2005). Until this is done, there is no justification for interpreting and manipulating the scores in the way that these ambivalence formulas would have us do. In fact, even if the ratings do reflect the quantitative differences of these dimensions, it is unclear what scores derived from adding or subtracting values from two independent dimensions reflect.

This lack of clarity is further exemplified by the SIM’s collapsing of similarity and intensity, which it identifies as two separate constructs, into a single score. By doing this, it obscures the respective relationships between them and ambivalence. For example, an individual who gave a positive rating of 5 and a negative rating of 3 would end up with the same SIM score as an individual who gave 2 for both. According to the SIM, the first person’s positive and negative feelings are more intense, and the latter person’s more similar, but they would be considered similarly ‘ambivalent’. By combining the two dimensions, Thompson et al. (1995) betray their own theoretical rationale.
In addition, this approach to measuring ambivalence relies upon the unfamiliar and perhaps unnatural process of providing independent ratings of positive and negative evaluations. For example, as demonstrated in Figure 1.1 above, the task may ask the individual to independently indicate how positive or negative their attitude toward the issue is whilst ‘putting aside’ the influence of the other. It has not been empirically established that this sort of judgement is possible. Just because a researcher can ask a respondent to ignore their negative evaluations whilst providing a positive rating does not mean that the respondent can comply with the request. In fact, by priming a respondent’s negative regard in the instructions for the task, the researcher may increase the likelihood that it affects their positive rating.

The above issues may explain why validation of these measures has only been moderately successful, with inter-correlations between these ambivalence scores and subjective reports of ambivalence typically ranging from .15 to .42 (Newby-Clark et al., 2002; Priester & Petty, 1996;). This has lead researchers to conclude that these different measures are actually assessing different constructs, with the latter tapping in to what has been termed ‘felt’, ‘subjective’ or ‘meta-psychological’ ambivalence. This conclusion is equally fraught by the influence of operationism, with researchers committing to assumptions regarding the underlying variable(s) based, for the most part, on their operationalisations of them. This point will be addressed in Chapter 5.

All of the above criticisms illustrate the shortcomings of the mainstream approach to assessing ambivalence. As an alternative, unfolding models have been shown to avoid and rectify many of these shortcomings (Andrich, 1996; Michell, 1994; Roberts, Laughlin & Wedell, 1999). It is the proposal of this thesis that the unfolding approach provides a more rigorous tool to measure ambivalent attitudes.
This approach allows researchers to both investigate the assumptions they are making regarding the structure of attitudes and assess ambivalence using methods that are proven reliable and that do not require independent indications of positive and negative evaluations.

1.7 Measuring ambivalence by unidimensional unfolding.

The unfolding approach will only be generally introduced here, as the specific models will be overviewed in Chapters 2 and 4. The unfolding approach is premised upon Coombs’ (1950, 1964) notion of the ‘ideal point’ whereby each individual is located at a specific point on the relevant attitude dimension and they make their judgements regarding the attitude items according to this location. That is, an individual will tend to endorse an attitude item if its judged location is sufficiently close to their own and vice-versa (Roberts et al., 1999). It is termed the ‘unfolding’ model as respondents’ preference orderings (I-scales) of the relevant attitude stimuli are said to hinge and fold around their ideal point. The underlying attitude dimension (qualitative J-scale) is discovered by undoing this folding, or ‘unfolding’ all individual preference orders. See Figure 1.2 below for an illustration of this process.
Figure 1.2. An illustration of a respondent’s preference ordering of seven attitude statements hinged around their ideal point which is most proximal to statement D.

Furthermore, as illustrated in Figure 1.3 below, this ideal-point response process, whereby degree of agreement is determined by the proximity of the item to the person’s location on the latent dimension, results in a single-peaked response function. Thus, in this example, a person’s degree of agreement with each of the items, A, B, C and D, is not necessarily determined by whether the valence of the item is consistent with the valence of their attitude. Rather it depends on whether the item falls close to their location on the latent dimension. Hence, even though items B expressed a negative attitude and item C expresses a positive attitude, as the person’s location falls between the two, an unfolding model would predict that the person would display similar levels of agreement with both.
Figure 1.3. The single-peaked function derived from the ideal-point response process whereby the degree of agreement with the negative items A and B, and the positive items C and D is determined by their proximity to the person’s location on the latent attitude dimension.

As a result of this hypothesised response process, unlike the method of summated ratings, the inclusion of items from the entire span of the attitude dimension is encouraged. Roberts et al. (1999) point out that traditional scaling techniques only lead to the inclusion of moderately located items that are either clearly positive or negative in nature. This is because the response process assumed by the method of summated ratings is inconsistent with the response behaviour...
exhibited on more ‘neutral’ or ‘extreme’ items. The preclusion of the sort of ‘neutral’ items that may capture ambivalence is not a feature of unfolding measurement models. In fact, such ambivalent items are entirely consistent with the unfolding approach and are typically used in applications of it.

For example, Andrich (1988, p.47) addressed participants’ attitudes toward capital punishment using such statements drawn from the original work of Thurstone (1928) as, “I don’t believe in capital punishment, but I am not sure it isn’t necessary” and, “I think capital punishment is necessary, but I wish it were not”. Roberts et al. (1999, p.217) included in their study of individuals’ attitudes toward abortion such statements as, “There are some cases where abortion is justified, but there are just as many cases where it is not”. Such items clearly express the sorts of mixed evaluations that underpin attitudinal ambivalence.

Thus, the unfolding approach promises the simplified approach of incorporating the measurement of ambivalence into a generalised attitude measurement procedure. The collection of data is done by commonly accepted methods such as the use of rating scales or pair comparisons, neither of which require participants to provide positive evaluations whilst ignoring negative evaluations and vice-versa.

In addition, unfolding applications have repeatedly considered other attitude parameters aside from one’s location on the evaluative dimensions. These include attitude intensity and the latitude of acceptance (Davies, 2004; Luo, Andrich & Styles, 1998). Consideration of these parameters appears relevant to the abovementioned discussion of the relationship between ambivalent evaluative judgements and subjective report of ambivalence (Thompson et al., 1995). These points will be further elaborated in the proceeding chapters.
Importantly, unlike the method of summated ratings and its reformulation discussed in Section 1.6, the unfolding approach allows for the test of one’s assumptions regarding the structure of the attitudes being examined. Specifically, whether it is tenable to continue conceptualising attitudes as bipolar and quantitative. This question is of immediate concern as ambivalence has been interpreted by a number of researchers as opposing the traditional bipolar view of attitudes (Cacioppo et al., 1997; Conner & Armitage, 2008, Thompson et al., 2005).

These researchers have argued that bipolarity entails a reciprocal relationship between the polar elements, i.e., the presence of one element entails the absence of the other. So, in the case of attitudes, the presence of a positive evaluation judgement necessitates the absence of a negative judgement and vice-versa. Clearly, ambivalence is inconsistent with such an understanding. As a result, Cacioppo & Bernston (1994) and Cacioppo et al. (1997) propose an alternate bivariate model, which splits the positive and negative halves of the bipolar continuum into two, independent dimensions.

Based on this argument, it appears that ambivalence is at odds with the application of unidimensional unfolding models. Furthermore, although unfolding models tolerant of multidimensional data have been developed (see Coombs, 1964; Hall, 1970), tests of quantitative structure in unfolding applications have not been generalised beyond the unidimensional case. This could pose a serious problem for a central aim of this thesis. However, Chapter 2 will present the argument that ambivalence is entirely consistent with a bipolar attitude dimension and that the conceptualisation of bipolarity provided by Cacioppo and his colleagues (1994, 1997) is incorrect. The ability to test this structural assumption is testament to the
superiority of the unfolding approach and its promise to clarify the consequences of ambivalence for attitudes.

1.8 Aims and structure of the thesis

Therefore, the general aim of this thesis is to investigate the implications of ambivalence for the conceptualisation and measurement of attitudes. By utilising the unfolding approach, it aims to investigate whether ambivalence is consistent with a unidimensional, bipolar understanding of attitudes. Furthermore, it intends to examine whether ambivalent attitudes may be located on a quantitative evaluative dimension and are thus measurable in the traditional sense. Finally, it aims to utilise a measure developed out of this work to more rigorously explore the relationship between conflicted evaluative judgements and a number of other attitude parameters, particularly subjective reports of ambivalence. To achieve this end, a number of steps must be completed and these are reflected in the chapter structure below.

Firstly in Chapter 2, an alternative conceptualisation of bipolarity that is consistent with ambivalence will be presented. The validity of this alternative model will be examined using the unfolding approach with respect to a measure that was developed from the bivariate perspective. The results will help illuminate whether, even when considering ambivalence, it is valid to continue conceptualising the evaluative dimension as bipolar. Additionally, it will determine whether the application of a unidimensional unfolding model is appropriate for the subsequent chapters.

In Chapter 3, social issues that a substantial proportion of the sample feels ambivalent toward will be determined. In particular, the specific conflicting
evaluations will be examined and utilised to construct the attitude scales for each of these issues. This will be done utilising a rigorous method that considers the semantic structure of evaluative propositions. This is crucial, as these attitude scales must be clearly ordered for tests of quantitative structure.

Following the construction of the scales, Chapter 4 will present unfolding and conjoint measurement analyses to determine whether the evaluative dimension for these issues, including ambivalent evaluations, may be validly treated as quantitative. This will not only provide further validation of the conceptualisation presented in this Chapter 2, but also has implications for the analyses employed in Chapter 5.

In Chapter 5, the relationships between evaluative judgements, the intensity and latitude of acceptance parameters and subjective judgements of ambivalence for these issues will be examined. This analysis will utilise latent variable modelling in an attempt to overcome operational biases that have confounded similar research. This examination of the latent structure of the evaluative system is expected to further validate the arguments regarding the relationship between ambivalence and the bipolar conceptualisation of attitudes as well as the use of the unfolding approach.

Finally, the implications and limitations of the thesis as well as proposals for future research will be addressed in Chapter 6.
2.1 Introduction

As previously discussed in Chapter 1, since the measurement of attitudes began with Thurstone (1928), the evaluative continuum has been conceptualised as bipolar in structure. Despite the intrinsic appeal of this conceptualisation, a number of researchers have called for its rejection in favour of a bivariate approach, arguing that bipolar models do not account for ambivalent attitudes.

The main proponents of a bivariate conceptualisation have been Cacioppo and his colleagues (Cacioppo & Bernston, 1994; Cacioppo, Gardner & Berntson, 1997, 1999). In the presidential address to the Society for Personality and Social Psychology, these proponents tolled what they saw as the death knell for the bipolar measurement of attitudes, citing a number of studies that they argue demonstrate the inadequacy of bipolar models (Cacioppo et al., 1997). In particular, psychometric examinations of the relationship between measures of positive and negative evaluations do not typically indicate strong inverse relationships. Such a relationship is presumed to be an implicit part of the bipolar understanding.

This chapter will present the argument that this evidence cannot be treated as conclusive as it is undermined by the assumption that linear analyses are appropriate for bipolar concepts (van Schuur & Kiers, 1993). Secondly, it will present a conceptual argument that the assumption that bipolarity entails a reciprocal relationship between the polar elements is incorrect, and thus ambivalent attitudes
are consistent with a bipolar conceptualisation. Finally, it will attempt to confirm this compatibility between ambivalent attitudes and a unidimensional, bipolar continuum using a probabilistic unfolding model. This will be done utilising scales developed by proponents of the bivariate conceptualisation of attitudes to ensure that the conclusions are not confounded by a bipolar bias in the measure.

2.2 Evaluating the evidence against the bipolar measurement of attitudes

Whilst acknowledging the almost self-evident appeal of the bipolar understanding of attitudes, Cacioppo et al. (1997) argue that it can no longer be taken seriously. As discussed in Section 1.7, their rejection of bipolarity is premised upon a definition whereby the relationship between the positive and negative substrates of an attitude is reciprocal, i.e., the presence of positive evaluations entails the absence of negative evaluations and vice-versa. In this sense, the bipolar continuum is postulated to range from extremely positive evaluations at one pole through a ‘neutral’ zone at the centre to extremely negative evaluations at the other pole. As a result of their reciprocal definition, Cacioppo et al. take this ‘neutral zone’ to be constituted by the absence of any significant positive or negative evaluation, or what is typically termed attitudinal indifference. As a result of this understanding, one of their primary criticisms is that such a model cannot account for attitudinal ambivalence. This leads them to conclude that a two-dimensional representation of attitude space is required to capture all possible attitude states.

In this representation, the relationship between positive and negative evaluations can be both reciprocal, as is typically conceived, as well as non-reciprocal, as is the case with ambivalent attitudes. The psychometric evidence for
this representation includes a number of studies where separate, bivariate measures of positive and negative evaluations were not found to significantly, negatively correlate nor load on to a common factor (Patchen, Hofman & Davidson, 1976; Cacioppo et al., 1997). Such linear analyses appear to confirm a bivariate evaluative continuum.

Furthermore, a number of participants in the above studies provided both strongly positive and strongly negative evaluations on these measures. Traditional bipolar measures, given their assumptions of reciprocity, would not have been able to accommodate these ambivalent individuals. Thus, it is argued that bipolar measurement scales must be abandoned in favour of bivariate scales. Consequently, Cacioppo et al. (1997) designed the Bivariate Evaluations and Ambivalence Measures (BEAMs), which include separate sets of items to assess positive, negative and ambivalent attitudes using unipolar rating scales. Scores on each of the scales are determined by a summated ratings procedure.

2.2.1 An alternative bipolar conceptualisation

Closer scrutiny of the evidence for the bivariate conceptualisation supports the conclusion that attitude measurement needs to move beyond the existing bipolar measures. Cacioppo et al. (1997, p. 6) correctly identify that the bipolar continuum implicitly accepted by attitude researchers for close to a century is in fact “artificial”. This artificial conception of bipolarity has likely been influenced by the method of summated ratings, which was discussed in Section 1.4.

However, it is unclear that the bipolar conceptualisation and measurement of attitudes needs to be abandoned altogether. Deeper consideration suggests that the
proponents of the bivariate understanding incorrectly assume that bipolarity entails a reciprocal relationship between then polar elements. Real bipolar variables possess a mixing of their polar elements at their centre. Thus, in the attitude domain, a bipolar dimension is able to accommodate ambivalence. This is made clear by considering any number of bipolar analogies.

One such analogy, which was incorrectly invoked by Cacioppo et al. (1997), is the balance knob on an audio stereo (see Figure 2.1). When turned to the left pole only sound from the left channel is audible, when turned to the right pole only sound from the right channel is audible. However, when turned to the centre the result is not the absence of either channel, but rather the mixing of the two to give stereo sound. A similar relationship is found when considering a mixer tap, which delivers hot and cold water in a bipolar fashion. At one pole it delivers hot water, at the other pole it delivers cold water, at the centre it delivers a mix of both hot and cold water, which is commonly termed warm.

In fact, it appears that the so-called bipolar continuum critiqued by Cacioppo et al. (1997) is implicitly bivariate. Achieving the analogous state to attitudinal indifference in the stereo example requires a unipolar balance knob for each channel so that no sound is emitting from the speakers. For the mixer-tap example, one requires both a hot and a cold tap turned to their off positions so that neither hot, nor cold water are flowing. Alternatively, one requires the additional dimension of a lever that controls water flow. It appears that the attitudinal state at the centre of the evaluative bipolar continuum should be interpreted as a ‘mixing’ of positive and negative evaluations, or attitudinal ambivalence. If this is empirically verified, it will greatly undermine the assertion that ambivalence entails the end for the bipolar conceptualisation of attitudes.
2.2.2 Linear analyses of bipolar constructs

In addition, the psychometric evidence for a bivariate understanding is undermined by its reliance upon linear analyses of the relationship between positive and negative evaluations. A similar debate in the affect literature has repeatedly criticised the use of correlational and factor analyses to confirm bivariate models. These criticisms have included the bivariate modellers disregard for the obscuring effect of measurement error, as well as the attenuating effect of ambiguous response formats.
on correlational analyses (Green, Goldman & Salovey, 1993; Russell & Carroll, 1999).

Of most relevance to the current chapter is the criticism by a number of authors that factor and correlational analyses are inappropriate for analysing bipolar concepts as they assume that the observed measures are linearly related to the underlying latent variable (Coombs & Kao. 1960; Ross & Cliff, 1964; Davison, 1976; Van Schuur and Kiers, 1994). As introduced in Chapter 1, when a dataset conforms to a unidimensional unfolding model this relationship is a single-peaked, non-linear function. This is because in unfolding models, individuals’ responses are contingent upon the distance between their locations (ideal-points) and the items’ locations on the latent dimension. Hence, even if a person and item are located on the positive side of the evaluative dimension, that person will only strongly endorse the item if their locations are sufficiently close. So in terms of correlational analyses, only items that are proximal on the dimension will highly positively correlate. As the distance between items increase, their correlation decreases toward zero and then increases again in the negative direction.

In terms of factor analyses, these authors point out that an unfoldable dataset will manifest an extra factor. This is problematic as it leads the researcher to erroneously conclude that there are two latent variables underpinning the responses. Van Schuur and Kiers (1994) suggest that this ‘extra-factor phenomenon’ is the most parsimonious explanation of the bivariate solution obtained in studies of the structure of emotion. Therefore, if it can be shown that responses to a bivariate attitude measure fit a unidimensional unfolding model, then correlational or factor analyses of the subscales of the measure can no longer be interpreted as compelling evidence
for the bivariate interpretation. This study will utilise the Hyperbolic Cosine Model (HCM) for this purpose (Andrich & Luo, 1993).

This model is being utilised instead of Coombs’ (1964) deterministic model, which is to be used in later chapters, as it is a probabilistic measurement model and thus more tolerant of unfolding violations. This is an important point for the current study as the stimuli to be utilised were not designed for unfolding applications and thus it is unlikely that they will adhere to the strict requirements of the deterministic model. Despite this tolerance of error, the responses must reasonably fit the assumptions of the model. This is crucial as, unlike the method of summated ratings, the model is falsifiable and it is therefore meaningful to ask whether attitude judgements are consistent with it. The specific details of the model are set out below.

### 2.3 The Hyperbolic Cosine Model

Like all unfolding models, the HCM approaches preferential judgement behaviour as being governed by an ideal-point response process, albeit in a probabilistic way. It is so named as the single-peakedness of the resulting response function is naturally captured by the hyperbolic cosine function. Unlike less restrictive non-parametric unfolding models, such as Van Schuur’s (1993), this model provides estimates of both the item ordering and location. This is important as these item location estimates allows for a more specific investigation of the alternative bipolar conceptualisation presented in 2.2.1, which hypothesises that ambivalent attitudes are located at the centre of the dimension.

The original HCM model for direct responses hypothesised that there are three latent responses that correspond to the manifest, Agree and Disagree responses.
These include; (1) Disagree below: because the person considers him/herself below the position of the statement, (2) Agree close: as the person considers him/herself close to the location of the statement, and (3) Disagree above: because the person considers him/herself above the position of the statement. These latent responses are illustrated in Figure 2.2 below, which is drawn from Andrich and Luo (1993).

*Figure 2.2. The category response functions for the three response categories; Disagree below (DB), Agree close (AC) and Disagree above (DA) (Andrich & Luo, 1993).*
If we take the example where an individual is asked to respond to a statement in which both they and the statement are located on the same linear continuum, if the individual’s location, denoted by $\beta$ in Figure 2.2, is very close to the statement location, denoted by $\delta$ in Figure 2.2, the person will tend to agree with the statement. As the distance between the individual’s location and the statement’s location increases, in either direction, the probability of an agree response will decrease. This is illustrated by the single-peaked (solid) Agree response curve in the Figure. This gives rise to the complementary Disagree response. The probability of a disagree response will increase as an individual’s location becomes greater than the statement’s, or as the location of the individual becomes less than that of the statement. This is illustrated by the two (broken) Disagree response functions. The fact that the manifest disagree response provides no indication of the direction in which the individual’s location is removed from the statements’ location gives rise to the ‘unfolding’ process (Andrich & Luo, 1993). This process allows the construction of a linear continuum in which direction has meaning from directionless responses by unfolding these responses around the individual’s location (their ideal point).

The HCM for rating or polytomous responses, which will be utilised in this chapter, is an extension of the above dichotomous example, albeit somewhat more complicated given the extra response categories present in the rating scale (Andrich, 1996; Luo, 2001). In this model, the category that represents the greatest agreement corresponds to a single latent agree close response function. All other ordered response categories correspond to two latent disagree response functions, disagree below and disagree above. So, as the distance between a person’s location and a statement’s location on the attitude continuum increases in either direction, the probability that the category of maximum agreement will be selected decreases. The
probability that one of the other categories will be selected is contingent upon the magnitude of the distance between the person and statement locations.

For example, in the 4-point rating scale case with the ordered categories, ‘Strongly Disagree’, ‘Disagree’, ‘Agree’ and ‘Strongly Agree’, the ‘Strongly Agree’ category corresponds to a single latent agree response function. The other three categories correspond to two latent disagree response functions whose proximity to the agree function is dictated by the manifest ordering of the categories. This may seem unusual for the ‘Agree’ response category as it is presumably selected to indicate a level of agreement with the item, not disagreement. However, in terms of the ideal-point response process, the fact that the person did not select the strongly agree category for the item indicates that the item is not sufficiently close to their own location. Thus, they do possess some level of disagreement with the item, either because its location is somewhat above or somewhat below their location, i.e., the item represents an attitude that is either somewhat too extreme or not extreme enough in comparison to their own. As the magnitude of this difference between the item and person locations increases the probability that the strongly disagree response category will be selected increases.

Parameters are estimated utilising the joint maximum likelihood estimation procedure and model fit is determined by a chi-square ($\chi^2$) fit statistic, which examines the statistical significance of the divergence between observed and expected values. Thus, Andrich (1996) and Luo (2001) spell out how the HCM can be applied to the sort of rating responses typically gathered in attitude research. This chapter will utilise this model to investigate whether a measure presumed to support

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3 For a thorough mathematical overview of the derivation of the HCM parameters see Andrich and Luo (1993), Andrich (1996) and Luo (2001).
the bivariate interpretation, in fact, fits a bipolar solution like the one depicted in Figure 2.2.

### 2.4 Aims and Hypotheses

The primary aim of this chapter is to examine whether ambivalence renders the assumption that attitudes possess a bipolar, unidimensional structure untenable. Specifically, it aims to demonstrate utilising an unfolding approach that ambivalence is consistent with the bipolar conceptualisation and measurement of attitudes. Furthermore, it intends to empirically verify the alternative conceptualisation of the bipolar evaluative dimension, which depicts ambivalent evaluations as constituting its centre.

Firstly, it is hypothesised that the linear (correlational and factor) analyses of the responses to the BEAMs will be consistent with past findings and interpretations, whereby there will be few strong negative correlations between the items of the positive and negative subscales and the positive, negative and ambivalent subscales will load on to separate factors. However, this will not be assumed to provide support for the bivariate interpretation as, secondly, it is hypothesised that the subscales will adequately fit the bipolar, unidimensional HCM. Furthermore, it is predicted that the items of the ambivalent subscale will be located toward the centre of the evaluative dimension.
2.5 Method

2.5.1 Participants

The study included 121 introductory psychology students from the University of Sydney. The sample included 86 females and 35 males. Their ages ranged between 17 and 27 (\( M = 19.20, SD = 3.23 \)). All participants received partial course credit in return for their participation.

2.5.2 Materials

This study utilised Cacioppo et al.’s (1997) Bivariate Evaluations and Ambivalence Measures (BEAMs) to assess attitudes toward abortion, Aboriginal Australians and homosexuality. These issues were selected as previous research has indicated that they are consistently subject to ambivalent evaluations (Alvarez and Brehm, 2002; Craig, Martinez & Kane, 2005; Katz & Hass, 1988; Katz, Wackenhut & Hass, 1986; Meyer, 1977). Furthermore, it seemed reasonable to the researcher that a significant number of first-year psychology students may feel ambivalent toward these issues. The presentation order of the issues was counterbalanced across participants.

The BEAMs consists of three subscales designed to assess positive, negative and ambivalent evaluations in a unipolar manner, i.e., ranging from the complete absence of that form of evaluation to the complete presence of it. Two forms of the positive and negative subscales were utilised, form A to assess people’s attitudes toward abortion and homosexuality, and form B to assess people’s attitudes toward Aboriginal Australians. The forms were split across the attitude issues rather than the sample within each issue in order to maximise the respondents for each of the unfolding analyses. This was not seen as problematic as both forms have been argued
to be statistically equivalent (Cacioppo et al., 1997). The items from each of the subscales are set out in Table 2.1 below. The presentation order of each subscale was counterbalanced across participants.

Unlike the ambivalence measure outlined in Section 1.6, the BEAMs do not rely upon any formulaic combination of positive and negative ratings as they include a subscale of ambivalent items. This inclusion of these ambivalent items enables the investigation of their location relative to the positive and negative items. Thus, the use of the BEAMs enables a test of the assumption that ambivalence necessitates a bivariate understanding. Furthermore, the scales were developed to minimise a bipolar interpretation of the measure, which may potentially confound the conclusions drawn from the unfolding analyses.
Table 2.1

*Form A and Form B Items of the BEAMs positive, negative and ambivalent subscales.*

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
<th>Ambivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>Favourable</td>
<td>Desirable</td>
<td>Undesirable</td>
</tr>
<tr>
<td>Appealing</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Pleasant</td>
<td>Likable</td>
<td>Unlikable</td>
</tr>
<tr>
<td>Agreeable</td>
<td>Happy</td>
<td>Unhappy</td>
</tr>
<tr>
<td>Approving</td>
<td>Supporting</td>
<td>Opposing</td>
</tr>
<tr>
<td>Rewarding</td>
<td>Good</td>
<td>Bad</td>
</tr>
<tr>
<td>Delighted</td>
<td>Attractive</td>
<td>Unattractive</td>
</tr>
<tr>
<td>Comfortable</td>
<td>Satisfying</td>
<td>Unsatisfying</td>
</tr>
</tbody>
</table>

Specifically, the different forms were developed to curtail participants treating the unipolar scales as bipolar scales. For example, if a participant was presented with the ‘positive’ item from the positive subscale and the ‘negative’ item from the negative subscale, they may tend to interpret the items as constituting a bipolar scale together and thus provide opposite responses based upon this interpretation. Therefore, instead of being presented with the opposite item, participants are presented with a synonym of it, which in this case would be ‘unappealing’. Cacioppo et al. (1997) argued that this minimised the interpretation of bipolarity across items.
In addition, the subscales were completed individually and were separated by a filler-task. This filler task consisted of a number of different esoteric analogies, e.g., “Chick is to Hen as Calf is to…” (Stankov, 1997). This filler task was included, consistent with Cacioppo et al. (1997), to further reduce the likelihood that participants interpreted each of the subscales as constituting a larger bipolar scale.

Participants indicated the extent to which each item reflected their attitude on a unipolar scale ranging from 1 (very slightly or not at all) to 5 (extremely). Note that this rating scale is different to the scale utilised to develop the HCM for polytomous responses. However, similar to the example provided in Section 2.3, any response less than 5 may be taken to indicate that the item was not sufficiently proximal to the person’s location on the dimension to warrant extreme agreement with it. Thus, it indicated a level of disagreement. In line with the HCM, this may either be because the item was located below or above the person’s location. Although this scale was unable to differentiate extreme disagreement with the items, this was deemed secondary to reducing any demand characteristic of the measure that may be interpreted as influencing the bipolar solution.

The Cronbach’s alpha reliability coefficients for each of the subscales and each of the forms were all acceptable, ranging from .81 to .92.

2.5.3 Procedure

Participants were tested in groups that ranged in size from 2 to 10 people. All questionnaires were administered electronically utilising Quask FormArtist survey software (http://www.quask.com)(See Appendix A for an example screenshot of the task and instructions). Participants were initially given a general introduction to the
purpose of the study as well as the relevant ethical information. They then completed all tasks across the three issues. Upon completion, they electronically submitted their data and were provided with a thorough debriefing of the study.

2.6 Results

The data were initially subjected to the traditional linear analyses, including correlational and factor analyses, to confirm that it was comparable to Cacioppo et al.’s (1997) original findings. As predicted, the overall inspection of the pattern of correlations between the positive and negative subscales items revealed no strong linear relationship, with correlations ranging from absent to only moderate in strength. The average of the positive-negative item correlations was -.32 for the abortion issue, -.22 for the Aboriginal Australians issue, and -.31 for the homosexuality issue. See Appendix B for the complete set of correlations.

In addition, as hypothesised, the results of the factor analyses revealed a three-factor solution for each of the issues, with the BEAMs positive, negative and ambivalent subscales only loading substantially on to single, separate factors. The averages of the loadings for each of the issues are presented in Table 2.2 below. See Appendix B for the complete set of factor loadings.

After demonstrating the data’s comparability with past findings, the unfolding analyses were performed using Luo’s (2002) RateFOLD2002 Version 2.03 software. The tests of fit and location parameters of the HCM for each of the issues can be seen in Table 2.3.
Table 2.2

Average of the Varimax factor loadings across items of the BEAMs positive, negative and ambivalent subscales for the abortion, Aboriginal Australians and homosexuality issues.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Abortion*</th>
<th>Aboriginal Australians**</th>
<th>Homosexuality***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F1</td>
<td>F2</td>
<td>F3</td>
</tr>
<tr>
<td>Negative</td>
<td>0.73</td>
<td>-0.18</td>
<td>0.24</td>
</tr>
<tr>
<td>Positive</td>
<td>-0.28</td>
<td>0.61</td>
<td>-0.05</td>
</tr>
<tr>
<td>Ambivalent</td>
<td>0.17</td>
<td>-0.09</td>
<td>0.76</td>
</tr>
</tbody>
</table>

* Eigenvalues were 8.45, 3.02 and 1.79 and the final solution explained 60.26% of the overall variance.
** Eigenvalues were 7.57, 3.73 and 1.72 and the final solution explained 59.18% of the overall variance.
*** Eigenvalues were 8.59, 3.67 and 1.52 and the final solution explained 62.68% of the overall variance.

An orthogonal rotation was applied and presented here to replicate the procedures of Cacioppo et al. (1997). However, given that one would expect some level of correlation across the subscales, an oblique rotation would have been more appropriate (Russell, 2002). Additional analyses were performed utilising an oblique rotation as well as both principal components and maximum likelihood extraction methods and the pertinent results were found to be equivalent to the above analysis across the three issues. Interestingly, when an oblique rotation was applied, the Positive and Negative factors were found to moderately, negatively correlate, ranging from -.34 to -.53 across the three issues.
Table 2.3

The Hyperbolic Cosine Model scaling solutions and tests of fit for the Abortion, Aboriginal Australians and Homosexuality BEAMs (Form B items in brackets were used for the Aboriginal Australians issue)

<table>
<thead>
<tr>
<th>Item</th>
<th>Abortion Location</th>
<th>$\chi^2$</th>
<th>Aboriginal Aus. Location</th>
<th>$\chi^2$</th>
<th>Homosexuality Location</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Delighted (Attractive)</td>
<td>2.89</td>
<td>4.34</td>
<td>1.92</td>
<td>14.31</td>
<td>2.80</td>
<td>42.34*</td>
</tr>
<tr>
<td>2) Comfortable (Satisfying)</td>
<td>2.85</td>
<td>13.00</td>
<td>1.85</td>
<td>10.96</td>
<td>2.63</td>
<td>12.70</td>
</tr>
<tr>
<td>3) Pleasant (Likable)</td>
<td>2.80</td>
<td>17.07</td>
<td>2.14</td>
<td>9.66</td>
<td>2.84</td>
<td>27.1*</td>
</tr>
<tr>
<td>4) Rewarding (Good)</td>
<td>2.75</td>
<td>18.47</td>
<td>2.12</td>
<td>15.74</td>
<td>3.20</td>
<td>14.25</td>
</tr>
<tr>
<td>5) Appealing (Positive)</td>
<td>2.68</td>
<td>12.70</td>
<td>1.98</td>
<td>18.01</td>
<td>3.13</td>
<td>34.87*</td>
</tr>
<tr>
<td>6) Approving (Supporting)</td>
<td>2.61</td>
<td>11.74</td>
<td>1.69</td>
<td>15.39</td>
<td>2.81</td>
<td>11.17</td>
</tr>
<tr>
<td>7) Agreeable (Happy)</td>
<td>2.29</td>
<td>25.66</td>
<td>2.33</td>
<td>14.18</td>
<td>2.62</td>
<td>20.99</td>
</tr>
<tr>
<td>8) Favorable (Desirable)</td>
<td>2.19</td>
<td>13.10</td>
<td>2.15</td>
<td>19.70</td>
<td>2.86</td>
<td>26.13</td>
</tr>
<tr>
<td><strong>Ambivalent</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) Jumbled</td>
<td>-0.93</td>
<td>21.92</td>
<td>-0.32</td>
<td>12.05</td>
<td>-1.23</td>
<td>22.18</td>
</tr>
<tr>
<td>10) Conflicted</td>
<td>-0.93</td>
<td>27.49*</td>
<td>-0.35</td>
<td>26.95*</td>
<td>-1.11</td>
<td>18.19</td>
</tr>
<tr>
<td>11) Muddled</td>
<td>-0.95</td>
<td>31.71*</td>
<td>-0.55</td>
<td>22.57*</td>
<td>-1.08</td>
<td>19.12</td>
</tr>
<tr>
<td>12) Divided</td>
<td>-1.00</td>
<td>16.34</td>
<td>-0.63</td>
<td>15.34</td>
<td>-1.22</td>
<td>29.67*</td>
</tr>
<tr>
<td>13) Contradictory</td>
<td>-1.01</td>
<td>32.25*</td>
<td>-1.00</td>
<td>15.57</td>
<td>-1.12</td>
<td>9.88</td>
</tr>
<tr>
<td>14) Tense</td>
<td>-1.33</td>
<td>7.00</td>
<td>-1.09</td>
<td>15.11</td>
<td>-1.21</td>
<td>27.27*</td>
</tr>
<tr>
<td><strong>Negative</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15) Unattractive (Distressed)</td>
<td>-1.41</td>
<td>14.52</td>
<td>-2.24</td>
<td>4.79</td>
<td>-1.76</td>
<td>22.18</td>
</tr>
<tr>
<td>16) Unsatisfying (Uncomfortable)</td>
<td>-1.56</td>
<td>23.20</td>
<td>-1.16</td>
<td>14.30</td>
<td>-1.56</td>
<td>19.21</td>
</tr>
<tr>
<td>17) Undesirable (Unfavourable)</td>
<td>-1.73</td>
<td>21.73</td>
<td>-1.50</td>
<td>10.61</td>
<td>-2.00</td>
<td>30.4*</td>
</tr>
<tr>
<td>18) Unhappy (Disagreeable)</td>
<td>-1.78</td>
<td>19.47</td>
<td>-1.25</td>
<td>10.40</td>
<td>-1.78</td>
<td>5.59</td>
</tr>
<tr>
<td>19) Opposing (Disapproving)</td>
<td>-1.87</td>
<td>8.93</td>
<td>-1.52</td>
<td>6.96</td>
<td>-1.79</td>
<td>13.51</td>
</tr>
<tr>
<td>20) Bad (Punishing)</td>
<td>-2.04</td>
<td>9.96</td>
<td>-2.17</td>
<td>4.36</td>
<td>-2.48</td>
<td>10.55</td>
</tr>
<tr>
<td>21) Unlikable (Unpleasant)</td>
<td>-2.22</td>
<td>14.36</td>
<td>-1.21</td>
<td>4.90</td>
<td>-2.22</td>
<td>8.89</td>
</tr>
<tr>
<td>22) Negative (Unappealing)</td>
<td>-2.26</td>
<td>9.86</td>
<td>-1.19</td>
<td>20.34</td>
<td>-2.35</td>
<td>18.80</td>
</tr>
</tbody>
</table>

*p < .05 indicating lack of fit to the HCM model.
The solutions obtained for the abortion, Aboriginal Australians and homosexuality BEAMs were mostly consistent with predictions. Inspection of Table 2.3 reveals that for each of the issues the items of the positive subscale were located at one end of the latent continuum, the negative subscale items at the other, and most importantly the ambivalent subscale items were located toward the centre of the continuum, although somewhat more to the negative end than expected. The overall test of fit revealed that the abortion ($\chi^2_{351} = 374.80, p = .18$) and Aboriginal Australians ($\chi^2_{351} = 302.18, p = .06$) BEAMs fit the unidimensional, bipolar HCM. Overall, the Homosexuality BEAMs were not found to fit the HCM ($\chi^2_{351} = 417.19, p = .01$). However, inspection of Table 3 reveals that 16 of the 22 items were in accordance with the HCM. This indicated that the overall misfit might have only been attributable to a small number of the items.

The statement maps for each of the issues, which illustrate the location of the BEAMs items and frequency distribution of respondents along the attitude continuum, are presented in Figure 2.3 below. Specifically, these maps illustrate how the ambivalent subscale items were more proximal to the negative end of the continuum than predicted. Of the three issues, the distributions of items for the Aboriginal Australians BEAMs were most in accordance with the third hypothesis, whereby the ambivalent subscale items were located at the approximate centre of the bipolar continuum.

In addition, the statement maps illustrate how the items of each subscale were quite clustered. This clustering was at a moderate location relative to the sample for the negative subscale and quite extreme for the positive subscale across the three issues.
Figure 2.3. Statement maps showing the location of the BEAMs subscale items relative to the frequency distribution of person locations on the latent continuum for the (a) abortion, (b) Aboriginal Australians and (c) homosexuality issues. The item numbers correspond to Table 2.3.
2.7 Discussion

Overall, the results provide evidence that ambivalent attitudes are consistent with a bipolar conceptualisation and that linear analyses cannot be used as evidence for a bivariate interpretation. As expected, the linear analyses were found to be consistent with past findings. But, as predicted, the abortion and Aboriginal Australians BEAMs were found to adequately fit the HCM. The homosexuality BEAMs were not consistent with the HCM, however, this overall misfit was largely attributable to a small number of the items.

The scaling solutions, particularly for the Aboriginal Australians BEAMs, were consistent with the hypothesis that the ambivalent subscale items would be located toward the centre of the evaluative dimension. These solutions provide preliminary validation of this chapter’s alternative bipolar conceptualisation.

In addition to the hypotheses, the dual scaling of both items and persons by unfolding analysis provided evidence that, counter to the assumptions of the summated ratings approach typically employed, the BEAMs were not invariant across issues and that particular items were more or less extreme and in some cases inappropriate for particular issues. This demonstrates the advantages of the unfolding approach beyond the ambivalence issue.

2.7.1 A new conceptualisation of bipolar attitudes

Just as the stereo balance knob and the mixer tap possess a mixing of the polar elements at their centre, this chapter provides preliminary evidence that ambivalence is at the centre of the bipolar, evaluative dimension. Although such validation has been implicit in earlier unfolding research, this study is the first to use a measure
developed out of the bivariate approach to demonstrate this. As explained in Section 2.5.2, the BEAMs were specifically developed to minimise the participants’ perceptions of them as bipolar. Thus, the overall bipolar solution obtained for two of the three attitude issues may be argued to be relatively free of any confounding effect of this potential demand characteristic. However, in contrast with the new bipolar conceptualisation, the scaling solutions for the ambivalent subscale located these items closer to the negative pole than expected, particularly for the abortion and homosexuality issues.

This finding is consistent with Cacioppo et al. (1997) who explain it as being the result of ambivalence’s greater affinity with negative evaluations. More simply, it could be the case that some participants perceive the descriptors in the ambivalence subscale as more mildly negative than ambivalent. This seems a reasonable speculation when one considers the valence of such items as ‘divided’, ‘tense’ or ‘contradictory’, which were consistently scaled close to the negative items. The items of this subscale appear to depict ambivalent or negative feeling states that may arise from ambivalent evaluations, rather than the evaluations themselves.

In addition, the overall misfit for the homosexuality issue may be seen as evidence for the bivariate interpretation. However, it appears that a number of the BEAMs items may not be appropriate for assessing attitudes toward this issue. Specifically, the items that contributed the greatest level of misfit were the ‘delighted’ and ‘appealing’ items of the positive subscale. The relevance of these items appears limited, particularly in the case of the latter, which may be quite differently interpreted by heterosexual and homosexual individuals.

Clearly, to further validate this new bipolar conceptualisation, attitude scales that include more carefully constructed ambivalent items that reflect conflicting
evaluations are needed. Furthermore, issues that have been empirically shown to be subject to considerable levels of ambivalence by the current sample should be considered. The establishment of these issues and the construction of such scales will be addressed in Chapter 3.

It should also be noted that the above discussion of the location of the items is intended in a very tentative manner. Any discussion of the relations between the items over and above their ordering implies that these differences are quantitative. As previously discussed, whether or not attitudes can be considered quantitative is an empirical question, and it is a question that the current chapter takes for granted. This is because even though this quantitative assumption is central to the HCM, the tests of fit employed are not sensitive to it. Hence, data that are demonstrably non-quantitative are able to fit the model (Kyngdon & Richards, 2007).

However, unlike most other instances of attitude research, this assumption will be tested in Chapter 4. Even if the HCM is artificially imposing quantitative relations making the discussion of locations nonsensical, the current chapter at the very least demonstrates that the ordinal relations between the items are consistent with the alternative conceptualisation of the bipolar ordering. That is, it provides support for the fact that attitudes are ordered from extremely positive through to extremely negative with ambivalent attitudes ordered between them. In addition to this question of quantitivity, there are a number of other criticisms that may be levelled at this alternative conceptualisation of bipolar attitudes.
2.7.2 Criticisms of the new bipolar conceptualisation

A potentially debilitating criticism of this new conceptualisation of the bipolar attitude continuum is that just as its predecessor discounts ambivalence, this model does not allow for the expression of indifferent attitudes. Inspection of the item misfit across the three issues reveals that a substantial number of these items are from the ambivalence subscale. It seems a reasonable speculation that this is attributable to the divergent interpretation of these items by ambivalent versus indifferent individuals.

Whilst at face value the fact that the new bipolar conceptualisation does not account for indifference appears to be a severe deficiency, deeper consideration suggests otherwise. When the attitude researcher utilises such procedures as those in the current study, what they are attempting to do is locate the respondents’ position on the evaluative dimension, whether it be understood as bipolar or bivariate. Attitudinal indifference is defined as the absence of any form of evaluation or significant attitude in the respondent, they simply do not care or may not know about the issue (Poortinga & Pidgeon, 2006). Thus, to attempt to locate such individuals on the evaluative dimension seems analogous to the absurd situation of attempting to weigh something that has no weight.

Such a point highlights the argument made by the social judgment theorists and attitude strength researchers (Krosnick, Boninger, Chuang, Berent & Carnot, 1993; Sherif, Sherif & Nebergall, 1965). This is the assertion that individuals’ attitudes cannot be represented as a single point on an evaluative dimension. They highlight the relevance of a number of other attitude parameters. In particular, what has been termed ego involvement or attitude intensity (Cooke & Sheeran, 2004; De Liver, Van der Pligt & Wigboldus, 2007; Thompson et al., 1995). It is such a
parameter that is far more adept at identifying indifference as it is directly concerned with how much an individual cares, or does not care, about a particular issue.

Furthermore, the relevance of the attitude intensity parameter goes beyond just the identification of indifference as it has been found to inform us about such factors as individuals’ susceptibility to change and to be predictive of behaviour over and above evaluative location (Krosnick et al., 1993). Thus, attitude intensity will be investigated in Chapter 5 to address this issue of where indifferent individuals locate themselves on the evaluative dimension, as well as its relationship with subjective reports of ambivalence.

Another potential criticism is that this chapter’s psychometric focus leads it to disregard a large proportion of the non-measurement based evidence cited in Cacioppo et al. (1997) for the bivariate conceptualisation of attitudes. They refer to a number of neurophysiological and experimental studies that indicate the independence of the positive and negative evaluative processes underpinning attitudes. However, the lack of extensive review of such evidence in this chapter is not a result of a psychometric bias. Rather there is no dispute regarding the growing body of evidence for this independence.

What the current argument does dispute is that these independent processes necessitate bivariate measurement. Green, Salovey and Truax (1999) make the point in the affect literature that the experience of positive and negative emotion may occur along bipolar lines even if the processes underlying these feelings are understood as being physiologically separable systems. Similarly, the experience of attitudes may vary along bipolar lines even if the underlying positive and negative evaluative processes are independent. Returning to the mixer tap analogy, even though the hot and cold water flowing from the tap are caused, to a certain extent, by
distinct processes, the endpoint is bipolar. It is the cognitive endpoint of an attitude, the evaluative judgement, which is being investigated in this thesis. The findings of this chapter provide preliminary evidence that it should equally be treated as varying in a bipolar manner.

2.7.3 Moving beyond the method of summated ratings in favour of unfolding approaches

In addition, the current findings present further evidence that Cacioppo et al. (1997) should not have been encouraging attitude researchers to move beyond bipolar conceptualisations, but rather to move beyond the ubiquitous method of summated ratings. The scaling solutions for the positive and negative subscales of the BEAMs reveals a pattern typical of a measure developed under the summated ratings approach (Roberts et al., 1999). This includes the bunching of similarly valenced items around a usually moderate location on the latent continuum. Such a pattern is particularly noticeable in the items of the negative subscale.

This is symptomatic of the method of summated ratings’ reliance upon the vast majority of individuals’ attitudes being located at moderate areas of the latent dimension to provide accurate estimates of them (Roberts et al., 1999). Whilst this may be found to be the case for a majority of individuals and issues, it is unclear why this should be assumed from the outset. Furthermore, even if the majority of participants may be estimated well for a particular issue by this approach, it is unclear why we should accept the poor estimation of the minority whose attitudes are located toward the extremes or centre of the dimension when there is a viable alternative model that can account for all.
In this chapter, preliminary evidence has been provided that unlike the method of summated ratings, the unfolding approach can account for ambivalent attitudes. This is because it does not require the exclusively positive or exclusively negative scoring of the stimuli and thus one can include the sorts of ambivalent items prohibited by the summated ratings approach. Similarly, Roberts et al. (1999) demonstrated that the unfolding approach can better account for attitudes at the extremes of the continuum, because it allows for the inclusion of extreme items. Unfolding models do not presume that an individual with an attitude of a certain valence will endorse all items of the same valence. Rather, they will only endorse the items with locations on the latent continuum sufficiently proximal to their own. These endorsed items may be positive, ambivalent or negative depending on the relative location of the person. Consequently, the unfolding approach encourages the provision of items that address the entire span of the attitude continuum, including central, moderate and extreme locations, whilst still permitting the use of the familiar rating scale methodology.

2.7.4 Conclusions

This chapter provides evidence that ambivalence is not at odds with the bipolar, unidimensional conceptualisation of attitudes. The ignorance of ambivalence has not been an artefact of bipolarity per se, but rather the artefact of treating bipolarity as necessitating an exclusively reciprocal relationship between the polar elements.

It demonstrated that the linear analyses presumed to support the bivariate standpoint are questionable and that under an unfolding approach ambivalent attitudes are an implicit part of the bipolar dimension. Thus, it is argued that
ambivalence does not require the abandonment of bipolarity, rather attitude researchers should move beyond the method of summated ratings in favour of unfolding models. These unfolding approaches promise more rigorous measurement of all attitudinal dispositions.

However, given that the findings were not entirely as predicted, such conclusions must be bolstered by the continued validation of this conceptualisation in future chapters. Furthermore, this discussion highlighted the importance of considering other attitude parameters beyond the evaluative dimension. Thus, these will also be considered in the proceeding chapters.

Crucially, the results of this chapter justify the use of a unidimensional unfolding model to investigate ambivalence. As discussed in Section 1.7, this is particularly important with respect to the tests of quantitative structure to be performed. Such tests additionally require the precise construction of scales so that there is unanimous agreement on the ordering of the items along the bipolar dimension. Michell’s (1994, 1998) binary tree method, drawing upon his theory of the ordered metric determinable, has been shown to successfully develop such attitude scales (Davies, 2004; Johnson, 2001; Michell, 1998). The construction and validation of these scales will be the focus of Chapters 3 and 4.
Chapter 3 - Constructing attitude scales for unidimensional unfolding

3.1 Introduction

Chapter 2 provided evidence that ambivalence is consistent with a bipolar understanding of attitudes, albeit a different understanding of bipolarity to the conventional view. These results validated the investigation of ambivalent attitudes utilising unidimensional unfolding models. However, there were a number of limitations of the findings, many of which may be attributed to the measure used. Consequently, this chapter will present the construction of attitude scales that account for a number of these shortcomings and that may be considered attitude measures according to the traditional theory of measurement.

Firstly, these scales will be constructed explicitly out of evaluative propositions, as these are the constituents of evaluative judgements, which is how the attitude construct was defined in Section 1.2. This will include a consideration of the relations between evaluative propositions and how these in turn relate to the quantitative assumption of attitudes. Secondly, a study will be performed to investigate the issues the participants consistently feel ambivalent toward in this context. This will also address the propositional underpinnings of this ambivalence. Finally, the binary tree method will be utilised to construct the scales for these issues that are appropriate for tests of quantitative structure and capture the relevant evaluative propositions.
3.2 Attitudes as evaluative judgements and the quantitative assumption

As discussed in Chapter 1, the APE model defines the cognitive element of attitudes as evaluative judgements. These judgements are underpinned by evaluative the propositions, which are subjected to syllogistic inferences to assess their subjective validity. It is this cognitive definition of attitude that is the focus of this thesis. Thus, if attitudes in this sense are to be treated as quantitative and therefore measurable, the relationships between these evaluative propositions and whether they are able to constitute a quantitative structure must be addressed (Michell, 1998). This requires a more rigorous understanding of the notion of quantity.

3.2.1 What is a quantity?

A quantity is a continuum of ordered magnitudes that stand in additive relations. Taking length as an example, a length of 5cm is greater than a length of 3cm and they add to a length of 8cm. Furthermore, length is continuous, as no matter how long a length it is always possible, hypothetically speaking, to combine it with another magnitude of length to create a larger magnitude until an infinite magnitude is reached. For a variable to be a quantity, its set of magnitudes must satisfy the following 7 conditions (Hölder, 1901, as cited in Michell, 1999):

1. Any two magnitudes are either the same or different, and if different, there is a third magnitude that equals this difference.
2. The addition of two discrete magnitudes must compose a magnitude that is greater than each.
3. If a magnitude is composed of discrete parts, the order of the composition of these parts is irrelevant.

4. When a magnitude is composed of three discrete parts, it is always the composition of any one with the remaining two.

5. There is no smallest magnitude.

6. There is no greatest magnitude.

7. There are no gaps in the ordered sequence of magnitudes and thus they are continuous.

Therefore, the assumption that an attitude is a quantity entails the assumption that the relations between the magnitudes of that attitude are ordered and additive and that the set of magnitudes are continuous, akin to the length example provided above. The claim that different attitudes are ordered is uncontroversial. For example, the evaluative proposition, ‘the Prime Minister is doing a good job’, appears to be clearly more favourable than the evaluative proposition, ‘the Prime Minister is doing a bad job’. However, the claim that attitudes are additive and continuous is far less obvious. Fortunately for the quantitative assumption, Michell (1994, 1998) explains how this may be the case using a binary tree method, which will be the focus of the next section.

3.3 The binary tree method

Michell’s (1994) binary tree procedure constructs ordered sets of attitude statements that only differ with respect to their evaluative predicates, i.e., all of the statements will pertain to the same subject term, but will differ in terms of the level of
favourability implied by their predicate term(s). These semantic differences between the predicate terms are believed to imply the ordering of the statements. For example, if I take the three statements; 1) the Prime Minister of Australia is doing a bad job, 2) the Prime Minister of Australia is doing a good, but not an excellent job, and, 3) the Prime Minister of Australia is doing an excellent job, then it can be seen that each share a subject term, the Prime Minister of Australia, but differ with respect to the level of favourability expressed by their predicate terms.

The first step in this procedure is to decide upon a kernel concept (e.g., the performance of the Prime Minister) and make the initial binary division, or bifurcation, into predicates (an expression of an attitude toward the subject) that are; (a) fairly general, (b) mutually contrary, and (c) ordered relative to the kernel concept (e.g., ‘doing a good job’ and ‘not doing a good job’) (Michell, 1994). This creates two new nodes to make further bifurcations from. One may then repeat this process from each subsequent node to establish the required number of stimuli as long as any predicate in the tree is within the semantic scope of its immediate ancestor. This process is illustrated in Figure 3.1 below.

Michell (1994) refers to the set of predicates resulting from this procedure as an ordinal determinable. However, he later argued that the binary tree determines more than just ordinal relationships as it also contains distance information (Michell, 1998). This is based on the principle that the distance between statements is related to their level of shared content, which is determined by the number of shared nodes in the binary tree.
Figure 3.1. Example of binary tree procedure whereby the kernel concept, the performance of the Prime Minister (PoPM), is bifurcated to create two new nodes containing the predicates, 1) doing a good job (GJ), and 2) not doing a good job (~GJ), from which further bifurcations can be made (p, ~p, q and ~q).

So, for the example presented in Figure 3.1, if statements A, B, C and D were constructed from the tree corresponding to the branches ending with p, ~p, ~q and q, the distance between statements A and B would be less than the distance between B and C as A and B share two nodes (PoPM and GJ), whereas B and C only share one (PoPM). Furthermore, the distance between C and D would be less than the distance between B and C for the same reason.

Michell (1998) refers to this structure as an ordered metric determinable (OMD) to reflect the addition of this distance information. Furthermore, he postulated that the ordered metric solution obtained from individuals’ preference judgements could be predicted from this information. However, Davies (2004) provided evidence that this is not the case. Her results suggested that it is the specific attitude dimension that determines the solution, as equivalent solutions were found
across sets of statements about the same issue, which were derived from different binary trees.

Despite these failings, this approach demonstrates, in principle, that evaluative judgements may possess quantitative structure. The predicates of the statements are akin to the evaluative propositions that constitute these judgements. The semantic relations between these predicates can be formally understood as implying order and distance information. This distance information entails an ordering upon the inter-statement midpoints and these midpoints are an additive function of the values of the statements on the attitude dimension, i.e., if we take the values of two statements A and B, the value of their midpoint AB is equal to \( \frac{1}{2} (A+B) \). Consequently, the structure reduces to a special case of finite additive conjoint measurement (Krantz, Luce, Suppes & Tversky, 1971). Furthermore, the process of bifurcation could be carried out indefinitely and thus there could be no most or least favourable attitude as, in principle, further predicates could always be added. Thus, the attitude may be understood as continuous.

However the conclusion that an attitude is quantitative, ultimately, must come down to empirical evidence. This will be the focus of Chapter 4 utilising Coombs’ (1964) unidimensional unfolding theory. In more practical terms, the binary tree method has provided attitude scales that are remarkably consistent with this model (Davies, 2004; Johnson, 2001; Michell, 1994, 1998; Sherman, 1994). Consequently, this chapter will now turn to the construction of a number of attitude scales using this methodology to apply in the next chapter. The first step in this process is to identify the kernel concepts, which in this context must be issues that individuals consistently feel ambivalent toward.
3.4 The identification of the attitude issues and the ambivalent evaluations

In addition to identifying three issues that consistently evoke ambivalence, this study aims to investigate the sort of conflicting evaluative propositions that underpin this ambivalence. This is so that the predicates used in the binary trees are representative of individuals’ evaluative judgements.

3.4.1 Method

Participants

The participants included 43 first-year psychology students from the University of Sydney. This included 31 females and 12 males and the average age was 18.35 (SD = .57). All participants received partial course credit in return for their participations.

Materials

Participants were asked to indicate their level of ambivalence toward 18 issues, which are listed in Table 3.1 below. They were provided with 5 different categorical response options, with the 1 to 5 categories intended to capture varying levels of evaluative conflict and the 0 category to capture ‘non-attitudes’. These options were: 0 - I have no attitude or am indifferent toward this issue; 1 - My attitude toward this issue is purely positive OR purely negative; 2 - My attitude toward this issue is predominantly positive OR predominantly negative; 3 - My attitude toward this issue is BOTH a little bit positive AND a little bit negative; 4 - My attitude toward this issue is BOTH moderately positive AND moderately negative; 5 - My attitude toward this issue is BOTH extremely positive AND extremely negative. Furthermore, they were asked to briefly describe why they felt ambivalent toward
each of the issues using free text. See Appendix A for screenshots of the tasks and the instructions.

**Procedure**

Participants were initially introduced to the purpose of the study and were provided with all relevant ethical information. They then completed the questionnaire, which was presented electronically using the Quask FormArtist survey software (http://www.quask.com). Upon completion they electronically submitted their data and were provided with thorough debriefing information.

**3.4.2 Results and Discussion**

The results for each of the issues are presented in Table 3.1 below. These issues were selected as they presented an extensive cross-section of issues that may be relevant to first-year psychology students. In addition, it was suspected that many of them would evoke ambivalent responses. The means were calculated by converting the ‘no attitude’ option to a score of 1 as it was interpreted as expressing an equivalent lack of ambivalence to the ‘purely positive or negative’ option. Furthermore, the frequencies for each category are presented, as the mean may be a problematic statistic for these categorical data.

Based on the results, the attitude issues selected were abortion, euthanasia and Aboriginal Australians. These issues displayed the highest mean rating of ambivalence. Furthermore, they displayed the highest frequencies of responses for the 3, 4 and 5 categorical responses, which were the most indicative of conflict in the participants’ evaluative responses. This was particularly important for the selection of the Aboriginal Australians issue over the existence of god and Iraq war issues.
Table 3.1

Means, standard deviations and frequencies for the categorical indicators of ambivalence toward the 18 issues.

<table>
<thead>
<tr>
<th>Attitude issue</th>
<th>M</th>
<th>SD</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euthanasia</td>
<td>2.65</td>
<td>1.31</td>
<td>10</td>
<td>2</td>
<td>7</td>
<td>11</td>
<td>10</td>
<td>3</td>
</tr>
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<td>Abortion</td>
<td>2.51</td>
<td>1.40</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>10</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Aboriginal Australians</td>
<td>2.37</td>
<td>1.38</td>
<td>7</td>
<td>11</td>
<td>5</td>
<td>9</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Existence of God</td>
<td>2.33</td>
<td>1.38</td>
<td>7</td>
<td>10</td>
<td>10</td>
<td>4</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Iraq War</td>
<td>2.26</td>
<td>1.22</td>
<td>9</td>
<td>6</td>
<td>12</td>
<td>8</td>
<td>6</td>
<td>2</td>
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<td>1.15</td>
<td>12</td>
<td>4</td>
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<td>9</td>
<td>8</td>
<td>0</td>
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<tr>
<td>Road Rage</td>
<td>2.21</td>
<td>1.23</td>
<td>7</td>
<td>9</td>
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<td>10</td>
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<td>11</td>
<td>9</td>
<td>11</td>
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<td>0</td>
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<tr>
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<td>1.30</td>
<td>8</td>
<td>13</td>
<td>4</td>
<td>12</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Police Brutality</td>
<td>2.02</td>
<td>1.16</td>
<td>7</td>
<td>14</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Homosexuality</td>
<td>2.00</td>
<td>1.23</td>
<td>14</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Gay Marriage</td>
<td>1.95</td>
<td>1.09</td>
<td>8</td>
<td>12</td>
<td>10</td>
<td>9</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Right of Women</td>
<td>1.88</td>
<td>1.28</td>
<td>5</td>
<td>21</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Muslim Australians</td>
<td>1.81</td>
<td>1.07</td>
<td>11</td>
<td>13</td>
<td>7</td>
<td>9</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Environmental Conservation</td>
<td>1.79</td>
<td>1.19</td>
<td>8</td>
<td>19</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Political Accountability</td>
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<td>1.01</td>
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<td>1</td>
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<tr>
<td>Sexual Abuse</td>
<td>1.47</td>
<td>0.93</td>
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<td>28</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Condom Usage</td>
<td>1.47</td>
<td>1.08</td>
<td>7</td>
<td>27</td>
<td>4</td>
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<td>2</td>
<td>2</td>
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</tbody>
</table>
The indications of the specific conflicting evaluative propositions for these issues were then inspected. See Appendix C for the complete list of conflicting evaluations provided by participants for the abortion, euthanasia and Aboriginal Australians issues. For the abortion issue, there was a tendency for participants to feel ambivalent because they were pro-choice for women, particularly in circumstances such as rape or severe financial hardship, but were also pro-life in the sense that the unborn child also possesses some ‘right’ to life and this must be protected. Examples of the conflicting evaluations toward abortion included:

“I believe that no body should be denied the right to live but at the same time feel for teenagers who have been raped and fall pregnant as I also feel sorry for teenage parents, as most of the time this is not the best situation for a child to be brought up in.”

“I don't believe in abortion, however, in some cases such as rape, or knowing that your child will have a disability, abortion should be considered.”

“I believe that every woman should be given the choice to abort if absolutely necessary but I feel that it should only be approved where there is no alternative and it is a desperate situation.”

This evaluative conflict between ‘pro-life’ and ‘pro-choice’ evaluative propositions is consistent with the findings of Craig, Kane and Martinez (2002), who found that participants were particularly ‘pro-life’ when abortion was elected simply because
the child was not wanted, and particularly ‘pro-choice’ when the pregnancy occurred under traumatic circumstances such as rape or extreme financial hardship.

Participants indicated evaluative conflict toward the euthanasia issue for similar reasons. They were ‘pro-choice’, particularly when the individual was suffering extreme pain or a terminal illness, but this conflicted with ‘pro-life’ evaluations that life is precious and that it could be misused to commit suicide in unjustifiable circumstances and even murder. Examples of the conflicting evaluations toward euthanasia included:

“Life as precious and killing immoral vs. a life in extreme pain worse than death and free choice.”

“My belief in euthanasia conflicts with concerns that this privilege may be misused either to murder or aid suicide.”

“My feelings of free will conflict with my beliefs relating to morality.”

The evaluative conflict toward the Aboriginal Australians issues tended to arise from the evaluations that Aboriginal Australians have been mistreated and deserve equality in our society versus the evaluations that the rights afforded to them in the push for equality (e.g., elevated welfare payments) have been abused, may promote ‘reverse discrimination’ and ultimately Aboriginal Australians are responsible for their equality. Examples of the conflicting evaluations toward Aboriginal Australians included:
“My belief is that while fair treatment is a responsibility and a right, it is earned and should not be expected if certain behaviour doesn't warrant it, that being said equality should be assured to all.”

“System doesn’t work, but they abuse the system.”

“My feeling that everyone deserves equal rights is conflicted in this situation by a question of what equal rights are. I feel that some aboriginals are now being afforded greater or lesser rights as way of compensation.”

These finding are consistent with the work of Katz and Hass (1988), who identified ‘ambivalent racism’. They argued that in the United States, social forces to reduce prejudice have created ambivalence in individuals between ‘egalitarian’ and ‘individualistic’ motives. This conflict stems from the evaluative belief that all social groups should be equal versus the belief that minority groups are responsible for their own disadvantage and often abuse the ‘helping-hand’ they are provided with. Clearly from the above results, similar beliefs exist for Aboriginals in the Australian context.

Thus, the kernel concepts selected for the binary tree procedures were; 1) ‘morality of abortion’, 2) ‘morality of euthanasia’ and 3) ‘equality of Aboriginal Australians’. An attempt was made to match the predicates of the binary tree to the semantic content of the evaluative conflict for each issue described above. In addition to the consideration of the issues and specific evaluative proposition, the applications of Coombs’ (1964) deterministic unfolding model in Chapter 4 requires a minimisation of error. Davies (2004) demonstrated how placing an additional
constraint on the binary tree structure successfully minimised the amount of erroneous judgements in such an application.

### 3.5 The binary tree method and reducing error

Given the deterministic nature of Coombs’ (1964) model, error is a pertinent issue as strictly speaking, the presence of any error falsifies the theory. However, a number of studies utilising the binary tree method of scale construction have, within the scope of what may be termed ‘acceptable error’, satisfied the strict conditions of Coombs’ theory (Davies, 2004; Johnson, 2001; Michell, 1994, 1998). This notion of ‘acceptable error’ is a vague one and typically a rule-of-thumb approach is applied whereby if overall there are less than 5% of judgements at odds with prediction of the model, then this is seen as confirmation of the model. If the model accounts for 95% of the preference judgements made, then it seems reasonable to accept the model and attempt to provide an account of what has caused the erroneous judgements (Michell, 1994). Others have argued that the presence of error necessitates the use of probabilistic models, such as the HCM outlined in Chapter 2, as these are tolerant and even reliant upon the presence of error in their fit to the data (Andrich, 2003).

Nonetheless, as Coombs’ (1964) model is to be utilised in the current thesis as it allows for the test of the quantitative assumption, any method that can potentially reduce the level of error is highly desirable. Recently, Davies (2004) specified a further constraint to the predicate structuring of the binary tree method that better ensures the unidimensionality of the attitude scale as well as the participants’ perception of the ordering of the statements. This constraint requires
that each subsequent bifurcation from the origin occur on the same branch such that all of the nodes fall along the same path through the binary tree. This process is illustrated in Figure 3.2.

Figure 3.2. Example of binary tree procedure with the scaling constraint whereby the kernel concept (KC), is initially bifurcated to create two new nodes containing an evaluative predicate (p) and the mutually contrary evaluative predicate (~p) and all further bifurcations occur on the same branch.

Davies’ (2004) study demonstrated that scales constructed with this additional constraint satisfied the necessary and sufficient conditions of Coombs’ (1964) model with a lower error rate than scales constructed from a binary tree without it (an average of 4% with the constraint versus 5.7% without it). However, despite this reduction of error, the addition of the scaling constraint results in statements that do not reflect the bipolar dimension discussed in the previous
chapter whereby ambivalent statements are at the centre. For example, a statement taken from the centre of her ‘Lesbian Social Distance’ binary tree expresses the attitude, ‘I’d speak to a lesbian in passing, mix with one socially, and be good friends with a lesbian, but I wouldn’t be physically intimate with a lesbian’. Whilst there is some level of mixing of favourable and unfavourable predicates, overall the statement reflects a predominantly positive attitude. But, this is not typically the case for scales derived from the binary tree method.

Figure 3.3. Example of a typical binary tree where the bifurcations are made along the two branches, and the resulting distribution of favourable (+) and unfavourable (-) predicates.
For example, in Michell’s (1994) original statements concerning the morality of homosexuality, the statement that was found to be located at the centre of the attitude dimension took the form, “I have no moral objections to homosexuality and, while not wanting to see it encouraged, believe it is a mistake to treat it as a crime”. Such a statement clearly expresses an ambivalent attitude as it is neither clearly positive, nor clearly negative, but rather the combination of its evaluative predicates depicts a mixed attitude. Such statements are typically located toward the middle of the binary tree as two branches stem from the kernel concept and bifurcations are made along both, not just the one as the scaling constraint requires. An example of this typical approach is provided in Figure 3.3 above. The distribution of the favourable and unfavourable predicates reflects the structure of the attitude dimension proposed in Chapter 2, whereby as you approach the centre of the tree there is a greater ‘mixing’ of the favourable and unfavourable predicates. Thus statements derived from the centre of the tree will be both favourable and unfavourable, i.e., ambivalent. Whereas, statements derived from the combination of predicates toward the top and the bottom of the tree will be more clearly favourable or unfavourable.

Thus, even though the scaling constraint has been found to reduce erroneous preference judgements, it appears that its limitation of bifurcations to a single branch in the binary tree, in turn, limits the majority of the derived statements to either the favourable or unfavourable half of the bipolar attitude dimension. This means that it cannot be totally adhered to in the current thesis, as statements that possess the structure discussed in Chapter 2 and depicted in Figure 3.3 are required.

Nonetheless, the scaling constraint will be applied to the two branches so that there will be no more than two branches in the binary tree. This will ensure that the
sets of statements from the top half of the tree and the bottom half of the tree will be independently scalable and thus the ordering between them will be clear. Therefore, the tree will rely on the semantic strength of the initial bifurcation from the kernel concept to ensure the correct perception of the ordering of the statements derived from the centre, which will not be constrained in this way. Furthermore, the predicates utilised in the top and bottom halves of the binary tree will be reasonably semantically matched to ensure a unidimensional interpretation of the attitude scales.

3.6 The binary trees and attitude statements for the abortion, euthanasia and Aboriginal Australians issues

The binary trees and the derived statements for the issues and evaluative predicates identified in Section 3.4 are presented in Figures 3.4, 3.5 and 3.6 below. Eight statements were created for each issue, as this is the minimum required for the test of an aspect of Coombs’ (1964) model, which will be elaborated in Chapter 4.

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5 See Appendix D for the binary trees and derived statements that were entirely consistent with these constraints. These statements had to be slightly altered, as participants’ perceptions of their ordering were inconsistent.
MoA = morality of abortion
MA = morally acceptable
UC = universal choice
AP = always prohibited
E = encouraged
SC = serious crime
A = all circumstances
M = murder

A. Abortion is extremely morally acceptable and should both be available as a choice and encouraged in all circumstances
B. Abortion is very morally acceptable, should be available as a choice in all circumstances and should be encouraged in many, but not all, circumstances
C. Abortion is very morally acceptable and should be available as a choice in all circumstances, but shouldn’t be encouraged
D. Abortion is morally acceptable and should be available as a choice in most circumstances, but shouldn’t be encouraged
E. Abortion is quite morally unacceptable and should be prohibited in most circumstances
F. Abortion is very morally unacceptable and should always be prohibited and treated as a minor crime
G. Abortion is very morally unacceptable and should always be both strongly prohibited and treated as a serious crime, but not as a form of murder
H. Abortion is extremely morally unacceptable and should always be strongly prohibited, treated as an extremely serious crime and as a hideous form of murder

Figure 3.4. Binary tree and resulting statements for the morality of abortion issue.
A. Euthanasia is extremely morally acceptable and should both be available as a choice and encouraged in all circumstances
B. Euthanasia is very morally acceptable, should be available as a choice in all circumstances and should be encouraged in many, but not all, circumstances
C. Euthanasia is very morally acceptable and should be available as a choice in all circumstances, but shouldn’t be encouraged
D. Euthanasia is morally acceptable and should be available as a choice in most circumstances, but shouldn’t be encouraged
E. Euthanasia is quite morally unacceptable and should be prohibited in most circumstances
F. Euthanasia is very morally unacceptable and should always be prohibited and treated as a minor crime
G. Euthanasia is very morally unacceptable and should always be both strongly prohibited and treated as a serious crime, but not as a form of murder
H. Euthanasia is extremely morally unacceptable and should always be strongly prohibited, treated as an extremely serious crime and as a hideous form of murder

Figure 3.5. Binary tree and resulting statements for the morality of euthanasia issue.
A. Aboriginal Australians should be helped more than any other group to become more equal and thus deserve greater economic assistance, political influence and should be given their sacred land to self-govern
B. Aboriginal Australians should be greatly helped to become more equal and thus deserve greater economic assistance, political influence, and should be given free use of their sacred land
C. Aboriginal Australians should be helped to become more equal and thus deserve greater economic assistance, but they receive enough political influence
D. Aboriginal Australians should be helped to become more equal, but they receive more economic assistance than they deserve
E. Aboriginal Australians should not be helped to become more equal as they are now responsible for their own disadvantage in most circumstances, but I can understand their anger
F. Aboriginal Australians should not be helped to become more equal as they are now always responsible for their own disadvantage, but I can understand some of their anger
G. Aboriginal Australians should definitely not be helped to become more equal as they are now always very responsible for their own disadvantage and thus I can’t understand their anger, but I don’t believe they are always inferior
H. Aboriginal Australians should definitely never be helped to become more equal as they are now always extremely responsible for their own disadvantage and thus I can’t understand their anger and I believe they are always inferior

*Figure 3.6. Binary tree and resulting statements for the equality of Aboriginal Australians issue.*
As can be seen from the above figures, a degree of license with respect to the intended binary tree structure had to be taken for some of the statements. Specifically, the pilot studies of Appendix D revealed that respondents were mostly inconsistent in their perception of the ordering of the Statements C, D, E and F, toward the centre of the binary tree structure. For the Abortion and Euthanasia scales, it was found that the ‘shouldn’t be encouraged’ predicate of Statement C was semantically more influential than the universal choice bifurcation and so lead some participants to interpret it as more negative than Statement D. Consequently, this predicate was also applied to Statement D.

There was also a tendency for the ordering of Statement D and Statement E to be confused and so the initial bifurcation was emphasised in Statement E by amending it to ‘quite morally unacceptable’ and the following predicate was stated as ‘prohibited in most circumstances’ rather than ‘not always prohibited’. Similarly, the favourability of Statement D was emphasised by stating the second predicate as, ‘available as a choice in most circumstances’, rather than, ‘not available as a choice in all circumstances’. Whilst these alterations somewhat reduce the ambivalent nature of these statements, they are deemed necessary for the consistent perception of their ordering by participants. Furthermore, this is not detrimental to the measurement of ambivalence by these scales, as Coombs’ (1964) model examines the preference ordering of all statements. So, ambivalence will be reflected in the entire preference order, rather than the agreement with any one statement.

For the Aboriginal Australians scale, it was found that as a result of the ‘understand their anger’ predicate of Statement F, it was consistently judged as more positive than Statement E. As a result, this predicate was appended to Statement E.
In addition, the distinction between Statement D and Statement E was emphasised by stating the second predicate of Statement E as, ‘responsible in most circumstances’, rather than, ‘not always responsible’. Similar to the other two scales, this alteration somewhat reduces the ambivalence of this statement, but it is necessary as it clarifies the order of the statements. It is predicted that the amendments to all of the scales will lead to adequate fit to Coombs’ (1964) unidimensional unfolding model in Chapter 4.

3.7 Conclusion

This chapter has demonstrated that, at least in principle, it is reasonable to search for order, additivity and continuity in evaluative judgements. However, as explained in Section 1.5, the quantitative assumption is ultimately an empirical question and thus must be tested. In aid of this, it demonstrated a rigorous means of constructing unidimensional sets of statements that are both consistent with the understanding of bipolarity presented in Chapter 2 and may be applied to Coombs (1964) unidimensional unfolding model. This application will be the focus of the next chapter and is intended to provide further evidence that ambivalence is consistent with both bipolar and quantitative structure.
Chapter 4 – Validating the bipolar and quantitative assumptions using Coombs’ unfolding model

4.1 Introduction

As previously discussed, unfolding models address a number of the limitations of the mainstream attitude methodology. Specifically, they allow for the assessment of attitudes across the entire dimension, including ambivalence, and the grafting of Coombs’ (1964) unidimensional unfolding theory to axiomatic conjoint measurement theory allows for an empirical test of quantitative structure. This chapter will take the attitude scales created in Chapter 3 and further validate the bipolar and quantitative assumptions by analysing individual’s preference judgements using Coombs’ model.

4.2 Coombs’ theory of unidimensional unfolding

This theory relates to preference orders for the items that constitute an attitude scale like those presented in Chapter 3. Individual’s preference orders, which he termed I scales, are collectively analysed to map the items and individuals on to a common latent dimension to form what he termed a J scale (denoting the scale’s joint accommodation of both individuals responses and stimuli). As generally discussed in Chapter 1 with respect to all unfolding models, he theorised that individuals will make preference judgements of attitude statements with respect to their ‘ideal point’, the perceived location of their attitude on the relevant attitude dimension. More
formally, if $S$ refers to a finite set of unidimensional, quantitatively structured stimuli and $A$ to a set of people, Coombs’ (1964) theory states that for any individual $i$ in $A$ and $X$ and $Y$ in $S$, where $m$ denotes point of maximal preference or ‘ideal point’:

$$i \text{ prefers } X \text{ to } Y \text{ iff } |m - X| < |m - Y|$$

That is, an individual will choose statement $X$ rather than statement $Y$ if and only if they perceive $X$ to be closer to their ideal point than $Y$. In this sense, a person’s preference for a particular attitude statement involves a distance relationship as their judgement regarding which two statements they agree with more is dependent upon the relative distance between the two statements and the individual’s ideal point (Bossuyt, 1990). A full set of judgements for each individual provides information regarding the distance between their ideal point and all of the statements ($I$ scale). The information within a full set of $I$ scales allows the establishment of the statement locations on the latent attitude dimension ($J$ scale). If Coombs’ (1964) model is empirically confirmed, this resulting $J$ scale is an ordered metric measurement scale (Michell, 1994). As discussed in Section 3.3, because the stimuli midpoints of an ordered metric scale are additive, it reduces to a special case of finite additive conjoint measurement (Krantz, Luce, Suppes & Tversky, 1971). The confirmation of Coombs’ model depends upon the corroboration of the following assumptions.
4.3 Assumptions of Coombs’ unidimensional unfolding theory

Coombs’ (1964) theory specifies five boundary conditions; 1) unidimensionality, 2) quantitivity, 3) single-peaked preference functions, 4) symmetry and monotonicity of the preference functions, and 5) Intersubjective congruence. These are explained below:

4.3.1 Unidimensionality

This condition stipulates that preference judgements must be made relevant to a single stimulus variable. Thus, the set of attitude statements utilised must be unidimensional in nature. If the statements do not possess this attribute, then preferential judgements of them are unlikely to be made with respect to a single stimulus variable and thus such judgements are not likely to unidimensionally unfold. For example, with the abortion scale presented in Figure 3.4, all preference judgements must be made with respect to a single factor, i.e., the morality of the act.

4.3.2 Quantitivity

This condition requires that the attribute is quantitative. This is because of Coombs (1964) reliance upon distance in explaining respondents’ preference judgements. If unidimensional preference space is Euclidean, as his notion of preferential distance asserts, then magnitudes within this space must adhere to the axioms of quantity put forth by Hölder (1901, as cited in Michell & Ernst, 1996, 1997). So, in the case of the abortion scale, it is not enough for the statements to be perceived as ordered on the underlying attitude dimension. Individuals must also perceive distance between
4.3.3 Single-peaked preference functions

This condition specifies that each person must only have one point of maximum preference with respect to the relevant issue (their ideal point). Thus, this condition stipulates that each individual only has one attitude toward the issue.

4.3.4 Symmetry and monotonicity

Given a single point of maximum preference, it follows that other points will be less preferred. Coombs’ (1964) theory stipulates that the extent to which an individual prefers any stimulus decreases as the distance between it and their ideal point increases and that this decrease is equivalent on either side of the ideal point. Thus, the further a statement is from the ideal point on either side of the dimension, the less it is preferred. This condition insists that not only is an individual’s preference function single peaked, but also that it is monotonic decreasing and symmetric about this peak.

4.3.5 Intersubjective congruence

This condition requires that all individuals must agree upon the location of the stimuli on the relevant dimension. This is essential for the establishment of the $J$
scale as without it the ordered-metric layout of the stimuli along the attitude
dimension will be discrepant across participants.

**4.4 Necessary and sufficient conditions for unidimensional unfolding**

Michell (1990) and Doignon and Falmagne (1991, as cited in Michell, 1994)
individually identified three necessary and sufficient conditions to establish that
the above assumptions are met. These are; 1) the folding condition, 2) the single path
condition, and 3) the cancellation condition.

**4.4.1  The folding condition**

For a set of \( n \) stimuli on a \( J \) scale, any of the \( n! \) distinct orderings are possible
individual preference orderings. Coombs’ (1964) theory predicts that no more than
\( 2^{n-1} \) of these will occur. Thus, for eight Statements, the theory predicts that only 128
\( (2^8 - 1) \) individual preference orderings will occur (Michell, 1990). This is because the
individual preference order (\( I \) scale) must reflect the qualitative \( J \) scale (i.e., for
eight statements, ABCDEFGH) folded around their ideal point. So, if an
individual’s ideal point is statement C, then a valid preference order according to
Coombs’ theory would be CBDAEFGH as this ordering may be unfolded around the
ideal point ‘C’ to recover the qualitative ‘\( J \) scale’. Whereas an invalid order would
be CBDAEFHG as the inversion of the ‘GH’ pair does not permit this unfolding
(refer to Figure 4.1).
Figure 4.1. Boomerang diagrams demonstrating the recovering of the qualitative $J$ scale (in red) from $I$ Scale 1, but not from $I$ Scale 2.

Satisfaction of the unfolding condition establishes the existence of ordinal unidimensionality. However, it does not establish agreement upon the midpoint order between the stimuli. For example, the preference orders CBDAEFGH and BCDEAFGH both satisfy the folding condition.

However, if an individual ($I_a$) provides the CBDAEFGH preference order they prefer statement $A$ to statement $E$ and thus it follows that;

$$I_a < \text{midpoint } (AE)$$

Furthermore, as they prefer statement $C$ to statement $B$ it follows that;

$$\text{midpoint } (BC) < I_a$$

Therefore,

$$\text{midpoint } (BC) < \text{midpoint } (AE)$$

If an individual ($I_b$) provides the BCDEAFGH preference order, then it follows by the same logic that;

$$\text{midpoint } (AE) < \text{midpoint } (BC)$$
Both cannot be true if the attribute is quantitative, as opposed to just ordinal, and hence a further condition is required to ensure the agreement upon the midpoint ordering (Davies, 2004). This is provided by the single-path condition.

4.4.2 The single-path condition

This condition ensures the satisfaction of the ‘Intersubjective congruence’ boundary condition of Coombs’ (1964) theory as it stipulates that all I scales must fall along a single path through the proximity graph. This graph arranges all of the I scales that are valid foldings of the qualitative J scale into paths. Two I scales fall on the same path if their ordering of the midpoints are connected (for every x and y that are not equal in an ordered set, either x is greater than y or y is greater than x), transitive (for every x, y and z in an ordered set, if x is greater than y and y is greater than z, then x must be greater than z) and asymmetric (for every x and y in an ordered set, if x is greater than y, y cannot be greater than x)(Michell, 1990). If all I scales fall along a single descending path through the proximity graph, this equates to collective agreement upon the location of the statements on the dimension, and provides a distinct ordering of the inter-stimulus midpoints.

The proximity of I scales on a single descending path are derived from the number of pair inversions they differ by. For example, the preference order CBDAEFGH is more like BCDAEFGH than CDBEAFGH as the latter differs by the inversion of the BD and AE pairs, whereas the former only differs by the inversion of the BC pair. See Figure 4.2 for an example of a proximity graph for 6 stimuli.
Figure 4.2. Proximity graph representing the proximities of the set of all foldings around $J = ABCDEF$ with the single-path marked by red arrows.
The single path condition results from a simple ordering of the inter-stimulus midpoints. Generally, for \( n \) stimuli there are \( \frac{1}{2}n(n-1) \) inter-stimulus midpoints and thus \( \frac{1}{2}n(n-1) + 1 \) inter-stimulus intervals (Coombs, 1964). Thus, for six stimuli there are \( \left[ \frac{1}{2} \times 6(6-1) \right] = 15 \) inter-stimulus midpoints and hence \( \left[ \frac{1}{2} \times 6(6-1) + 1 \right] = 16 \) inter-stimulus intervals. The ordering of the midpoints dictated by the single path depicted in Figure 4.2 is set out in Figure 4.3 below.

\[ \begin{array}{cccccccccc}
AB & AC & AD & BC & BD & CD & AE & AF & BE & BF & CE & CF & DE & DF & EF \\
E & E & E & E & E & E & A & F & F & B & B & B & B & B & B \\
\end{array} \]

Figure 4.3 demonstrates that given a set of six stimuli, only 16 of the 32 preference orderings consistent with the qualitative J scale are in turn consistent with the same ordered metric J scale. However, even though satisfaction of the single path condition ensures that a unique ordering of the inter-stimulus midpoints has been determined, not all of the orders can be realised unidimensionally as some entail
contradictions (Michell, 1994). Thus, a set of preference orders unfolds unidimensionally only when the order upon inter-stimulus midpoints established by the single path condition, in turn, satisfies the hierarchy of cancellation conditions stipulated by Scott (1964).

4.4.3 The cancellation condition

The testing of the hierarchy of cancellation conditions is the extension of Luce and Tukey’s (1964) conjoint measurement theory to the theory of unidimensional unfolding. Conjoint measurement theory allows for the testing of additive structure amidst the observable ordinal relations of a variable. Satisfaction of the cancellation conditions supports, but does not prove, the existence of additive structure. The first level of the hierarchy, single cancellation, is satisfied by the folding and single path conditions of Coombs’ theory (Michell, 1994). In addition, tests of double cancellation and triple cancellation of this hierarchy have been empirically explicated (Kyngdon & Richards, 2007; Michell, 1988). The test of double cancellation requires at least six stimuli in the attitude scale and the test of triple cancellation requires at least eight stimuli in the attitude scale. The satisfaction of this condition is essential to establishing the quantitative J scale as it ensures that there are no contradictions entailed by the midpoint ordering and thus that an additive representation of the ordering is possible (Michell, 1994).

The tests of double cancellation are illustrated in Figure 4.4 below. To satisfy double cancellation the ordering of the midpoint comparison represented by the middle line in each of the matrices must not oppose the order on both the outer pairs.
So the direction of the arrow of the middle line must not oppose the direction of both the outer lines.

Figure 4.4. Tests of double cancellation for 6 items where $J = ABCDEF$.

Thus, the establishment of congruence between individual preference orders and the qualitative $J$ scale (folding condition) as well as the congruence in perception of the inter-stimulus midpoints (single-path condition) and satisfaction of tests of additivity (cancellation condition) collectively allow for the construction of a quantitative $J$ scale. If Coombs’ (1964) theory is true, this is a measurement scale in the traditional sense.
4.5 Validating the attitude scales using Coombs’ unidimensional unfolding theory

The above discussion of the strict requirements of Coombs’ (1964) model further illuminates why such a large degree of precision and stimulus control was required in the scale construction of Chapter 3. The assumptions of the model require that these statements are strictly ordered and that this ordering is easily discernable by participants. Furthermore, they require that participants’ preference judgements of the statements are valid foldings of this ordering and collectively indicate a consistent ordering of the inter-statement midpoints to provide an ordered-metric solution.

Therefore, this chapter aims to empirically investigate the fit of the abortion, euthanasia and Aboriginal Australians scales to Coombs’ (1964) model by a twofold procedure. Firstly, Study 1 will assess participants’ perceptions of the ordering of the statements of each scale. It is expected that, within the scope of reasonable error, these perceptions will be consistent with the ordering specified by the binary tree procedure. Reasonable error is defined as less than 5% of judgements being at odds with this order. Furthermore, participants will be asked to rate their perception of the favourability and unfavourability of the statements of the three attitude scales. This is particularly to ensure that they perceive the ambivalent statements as similarly favourable and unfavourable.

Secondly, Study 2 will establish the location of the statements for each of the scales by assessing participants’ preference judgements. It is hypothesised that, given the confirmation of the ordering of the statements in Study 1, these preference judgements will confirm, within the scope of reasonable error, the necessary and sufficient conditions of Coombs’ (1964) model. This will permit the construction of
ordered metric solutions. In this case, reasonable error is defined as less than 5% of judgements being at odds with the model. Additionally, in line with the conceptualisation presented in Chapter 2, it is predicted that these ordered metric solutions will locate the ambivalent statements of each of the attitude scales close to the centre of the dimension.

4.6 Study 1: Testing the perception of the ordering of the statements

4.6.1 Method

Participants

All participants (n=30) were first-year Psychology students at the University of Sydney who received partial course credit. There were 22 females and 8 males and the mean age was 21.02 (SD = 6.05). 28 of the 30 participants indicated English was their first language and all indicated English was their best language. The Mean rating of their ability to understand English was 4.83 out of 5 (SD = .46). A strong grasp of English was important for the participants, as correct perception of the ordering of the statements requires a strong grasp of the semantic intricacies of the binary tree structure (Michell, 1994).

Materials

The main materials were the attitude scales overviewed in Section 3.6. The questionnaires were presented via computer using the Quask Formartist survey software (http://www.quask.com). Participants indicated their perception of the ordering of the statements via pair comparison judgements. Pair comparisons were
utilised as Michell (1998) demonstrated that this method was more sensitive than rank ordering or rating methodologies to the ordered structure of statements. The pair comparisons were counterbalanced using the optimum orders of Ross (1939).

In addition, participants indicated their perception of the favourability and unfavourability of each of the statements through two 5-point rating scales, ranging from “1 – not at all favourable” to “5 – extremely favourable”, and, “1 – not at all unfavourable” to “5 – extremely unfavourable”.

Procedure

Participants were tested in groups ranging from 2 to 8 individuals in size. At the beginning of the testing session, participants were given a general introduction to the purpose of the study as well as the relevant ethical information. In addition, they were instructed to carefully follow all instructions provided and to ask for clarification from the experimenter if they were unsure about either of the tasks. Participants then completed the three tasks via computer. Upon completion they were provided with a thorough debriefing of the study.

4.7 Results and Discussion

4.7.1 Pair comparison task

There were two types of errors possible in individuals’ ordering judgements in this task, intransitive judgement and ordering errors. An intransitive judgement error occurred when an ordering judgement was inconsistent with the other ordering judgements, e.g. the participant judged Statement A more favourable than Statement
B and Statement B more favourable than Statement C, but inconsistently judged Statement C more favourable than Statement A. An ordering error occurred when the individual’s set of ordering judgements did not provide the solution ABCDEFGH.

For the morality of abortion issue, 20 out of 30 (67%) individuals indicated a perception of the ordering consistent with the predicted statement ordering. There were 13 intransitive judgement errors and 11 ordering errors. Thus, overall, 24 of the 840 (2.86%) pair comparisons made across all participants were inconsistent with the predicted ordering of the statements.

For the morality of euthanasia issue, 20 out of 30 (67%) individuals indicated a perception of the ordering consistent with the predicted statement ordering. There were 9 intransitive judgement errors and 5 ordering errors. So, 14 of the 840 (1.67%) pair comparisons made across all participants were inconsistent with the predicted ordering of the statements.

For the equality Aboriginal Australians issue, 16 out of 30 (53%) individuals indicated a perception of the ordering consistent with the predicted statement ordering. There were 14 intransitive judgement errors and 14 ordering errors. Consequently, 28 of the 840 (3.33%) pair comparisons made across all participants were inconsistent with the predicted ordering of the statements.

Overall, the ordering errors tended to be associated with the statements drawn from the middle of the binary tree structure. Fourteen (47%) of the folding errors were for the CD and DE statement pairings across the three issues. This is unsurprising given the findings of Hovland and Sherif (1952), Michell (1973) and Davies (2004), which provided evidence that items located toward the middle of the attitude dimension are not as clearly defined for participants and so display more movement and displacement around the dimension. Despite this, the low nature of
the overall error rate for these statements across the three issues appeared to make them suitable for use in Study 2.

4.7.2 Ratings task

The mean ratings of favourability and unfavourability of each of the statements for each of the issues are presented in Figure 4.5, 4.6 and 4.7 below. As illustrated in these figures, the distribution of favourability and unfavourability across the statements for the three issues was reasonably in line with expectations. For the abortion issue, Statements A, B, F, G and H were perceived as predominantly favourable or unfavourable. Statements C, D and to a lesser extent E were rated similarly favourable and unfavourable, indicating their ambivalent nature. For the euthanasia issue, Statements A, B, C, F, G and H were perceived as predominantly favourable or unfavourable. Statements D and E were rated similarly favourable and unfavourable, indicating their ambivalent nature. The distinction in the ratings given to the abortion and euthanasia sets of statements is curious given that their binary tree structure and semantic content are identical. It appears that the attitude issue affects perceptions of the statements over and above their strict semantic structuring.

For the Aboriginal Australians issue, Statements A, B, E, F, G and H were rated as predominantly favourable or unfavourable. In contrast, statements C and D were rated similarly favourable and unfavourable, indicating participants’ perceptions of them as ambivalent in nature.

Overall, the ratings of favourability and unfavourability were consistent with the predicted ordering of the statements and reinforce the findings of the pair comparisons task. Furthermore, the small standard errors of each of the mean ratings
indicate that there was minimal variability in the ratings provided, and so these perceptions of the ordering as well as the favourable and unfavourable nature of the statements were reasonably consistent across participants. These findings reinforced the conclusion that these statements were suitable for a test of Coombs’ (1964) theory to investigate their locations.

**Figure 4.5.** Mean ratings of favourability (Fav) and unfavourability (Unfav) of each of the statements for the morality of abortion issue.

**Figure 4.6.** Mean ratings of favourability (Fav) and unfavourability (Unfav) of each of the statements for the morality of euthanasia issue.
Figure 4.7. Mean ratings of favourability (Fav) and unfavourability (Unfav) of each of the statements for the equality of Aboriginal Australians issue.

From these ratings analyses as well as the argument of Chapter 2, it is expected that statements C, D and E of the abortion issue, statements D and E of the euthanasia issue and statements C and D of the Aboriginal Australians issue will be located close to the centre of the attitude dimension.

4.8 Study 2: Establishing the ordered-metric structure and location of the statements via preference judgements

4.8.1 Method

Participants

All participants (n=50) were first-year Psychology students at the University of Sydney who received partial course credit. There were 33 females and 17 males and
the mean age was 20.28 (SD = 2.59). 42 of the 50 participants indicated English was their first language and 49 indicated English was their best language. The Mean rating of their ability to understand English was 4.74 out of 5 (SD = .66).

Materials

The main materials were the attitude scales from Study 1, presented in Section 3.6. The questionnaires were presented via computer using the Quask Formartist survey software (http://www.quask.com). Participants indicated their preferences for the attitude statements via pair comparison judgements. The pair comparisons were counterbalanced using the optimum orders of Ross (1939).

Procedure

Participants were tested in groups ranging from 2 to 8 individuals in size. Participants were given a general introduction to the purpose of the study as well as the relevant ethical information at the beginning of the session. It was stressed to them that they must follow the instructions carefully and to ask the experimenter if any clarification of the task was required. Participants then completed the two tasks via computer. Upon completion they were provided with a thorough debriefing of the study.
4.9 Results and Discussion

4.9.1 Pair comparison task

In this study, there were three types of error possible in individual’s preference judgements; intransitive judgement, folding, single-path and cancellation condition errors. An intransitive judgement error occurred when a preference judgements was inconsistent with other preference judgements, e.g., the participant judged Statement B closer to their own attitude than Statement C, and Statement C closer to their attitude than Statement D, but judged Statement D closer to their attitude than Statement B. In that case the intransitive judgement has occurred for the BD statement pairing. A folding error occurred when the preference order was not a valid folding of the J scale ABCDEFGH, e.g., CBDFEGH. In that example, the folding error has occurred for the EF statement pairing. A single-path error occurred when the valid preference order did not fall on the single-path through the proximity graph and thus their perception of the inter-statement midpoint ordering differed to the majority. This error was attributed to the judgment of the statement pair that had to be corrected to fit the preference order with the single-path solution.

As illustrated in Table 4.1 below, there were unacceptable levels of intransitive and folding errors in the preference judgements across the three issues. Thus, the preference orders were not tested with respect to the single-path and cancellation conditions.
Table 4.1

Intransitive judgement (Int.) and folding (F.) errors for each of the statement pairs for the abortion (AN), euthanasia (EU) and Aboriginal Australians (AA) issues.

<table>
<thead>
<tr>
<th>Statement Pairs</th>
<th>AN Int.</th>
<th>AN F.</th>
<th>EU Int.</th>
<th>EU F.</th>
<th>AA Int.</th>
<th>AA F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>AC</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>AD</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>AE</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>AF</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>AG</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
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<tr>
<td>AH</td>
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<td>0</td>
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<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>BC</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>BD</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>BE</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>BF</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>7</td>
<td>0</td>
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<tr>
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<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>BH</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CD</td>
<td>1</td>
<td>11</td>
<td>4</td>
<td>9</td>
<td>1</td>
<td>10</td>
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<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>3</td>
</tr>
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<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
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<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>CH</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>DE</td>
<td>9</td>
<td>12</td>
<td>4</td>
<td>14</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>DF</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>DG</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>DH</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>EF</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>EG</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>EH</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FG</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>FH</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>GH</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>52</td>
<td>64</td>
<td>52</td>
<td>59</td>
<td>68</td>
<td>66</td>
</tr>
</tbody>
</table>
For the abortion issue, there were a total of 52 (3.71%) intransitive judgements and 64 (4.57%) folding errors, resulting in an overall error rate of 8.28%. The DE statement pair was involved in 17% of the intransitive judgements. The remaining 83% were reasonably spread across the other statement pairs. The folding errors were far more localised with the BC (8%), CD (17%), DE (19%) and FG (11%) statement pairs involved in 55% of them.

For the euthanasia issue, there were a total of 52 (3.71%) intransitive judgements and 59 (4.21%) folding errors, resulting in an overall error rate of 7.92%. The AE (8%), AH (10%), CD (8%), DE (8%), DH (8%) and FG (8%) statement pairs were involved in 50% of the intransitive judgements, with the other half reasonably spread across the other statement pairs. Again the folding errors were more localised, with the BC (8%), CD (15%), DE (24%) and FG (8%) statement pairs involved with 55% of them.

For the Aboriginal Australians issue, there were 68 (4.86%) intransitive judgements and 66 (4.71%) folding errors, resulting in an overall error rate of 9.57%. The AF (13%), BF (10%), BG (7%), CE (12%), DF (9%) and DG (6%) statement pairs were involved in 57% of the intransitive judgements, with the remaining 43% fairly spread across the other statements pairs. The AB (8%), BC (11%), BD (8%), CD (15%), DE (12%) and EF (7%) statement pairs were involved in 61% of the folding errors.

Clearly the ordering of the statements is variable across task contexts and individuals. This inconsistency in the findings of the studies may be attributable to the differences in the response behaviour mechanisms of the tasks.

In Study 1, participants’ judgements were only influenced by their perception of the favourability and hence location of the statements on the attitude dimension.
As previously discussed, the fluidity of these perceptions of statements located toward the middle of the dimension is a possible explanation for the erroneous judgements in that study. In Study 2, participants’ judgements were not only influenced by their perceptions of the item location, but also, if Coombs’ (1964) theory of response behaviour is correct, contingent upon the location of their own attitude, i.e., their ideal point.

With respect to the first point, there is support that some individuals’ perceptions of the locations of the middle statements were not fixed. The CD statement pair was involved in 17.19% of the folding errors for the abortion issue, 15.25% of the folding errors for the euthanasia issue and 15.15% of the folding errors for the Aboriginal Australians issue.

In addition, with reference to the influence of the ideal point on erroneous pair comparison judgements, De Soete, Carroll and De Sarbo (1986) demonstrated that some individuals may not possess a fixed location on the dimension and thus their ideal point may ‘wander’. If this wandering takes place across the individual pair comparison judgements, then these individuals will make a large number of intransitive judgements and folding errors.

This postulation is supported by the finding that 50% of the erroneous judgements were made by 12 (24%) participants for the abortion issue, 14 (28%) participants for the euthanasia issue, and 10 (20%) participants for the Aboriginal Australians issue. Clearly, most participants’ preference judgements were consistent with the predicted ordering. These individuals may not have perceived the location of the items as fixed or may not have had any fixed ideal point on the attitude dimension.
Furthermore, the spread of intransitive judgements across a large number of statement pairs indicates that the errors may be attributable to the cognitive load placed on participants by this task, as well as moments of inattention and procedural errors in responding. Clearly to achieve the aims of this chapter, new statements need to be formulated that address the above explanations of the unacceptable levels of error.

4.10 Study 3: The formulation of new attitude scales and the determination of the item locations.

The results of Study 2 outlined a number of issues necessitating the revision of the attitude scales. Firstly, the reasonably non-systematic distribution of the intransitive judgements across the statement pairs gave an indication that the cognitive load of the task may have been too great for some participants (Davies, 2004; Torgerson, 1958). With 8 statements there are 28 pair comparisons to be made and participants can find this amount too taxing and laborious. Torgerson (1958) suggests two solutions to alleviate the laborious nature of pair comparisons. Firstly, the researcher can reduce the number of items to be compared. Secondly, the researcher can reduce the number of pair comparisons by only comparing items that are in the immediate vicinity of one another on the ordered dimension, e.g., in Study 2 above, Statement A would only be compared with Statements B and C as the ordering is presumed to be clear enough to ensure that participants would not make mistakes in comparing Statement A to the other statements. The latter option seemed too presumptuous as the results of Study 2 indicated that errors were not just localised to statements
presumed in the immediate vicinity of one another. Therefore, it was decided to reduce the amount of statements for each of the issues from 8 to 6.

This reduction in the number of statements is deemed acceptable for a number of reasons. Firstly, 6 statements still permit a test of the cancellation condition of Coombs’ (1964) theory and hence allow for a crucial test of quantitative structure. In addition, the use of 6 statements only requires 15 pair comparisons to be made and so significantly reduces the cognitive load of the task. This cognitive load is further reduced by the reduction of the complexity of the predicate structure, whereby statements will include the combination of a maximum of 3 predicates of the binary tree, rather than 4, as required by 8 statements. Similarly, 15 pair comparisons reduce the time required for the completion of the task, which may lead to more sustained attention throughout its duration.

The findings of Study 2 also demonstrated that the ‘wandering’ locations of the statements, particularly toward the centre of the dimension, might have contributed to the unacceptable level of erroneous judgements. The revised statements address this issue in a number of ways with a goal to more clearly delineate their ordering. Firstly, with the exception of Statement C, items derived from the middle of the binary tree structure will be worded so that they are moderately favourable or unfavourable rather than ambivalent. This is because the locations of ‘neutral’ items have been found to be the most likely to move around (Davies, 2004; Michell, 1973). Given the importance of accurately assessing individuals with ambivalent attitudes, Statement C will remain ambivalent in nature.

Furthermore, the binary tree structure outlined in Figure 3.4, whereby there are only 2 branches stemming from the initial bifurcation from the kernel concept, will be more strictly adhered to. The deviations from this structure in the statements
utilised in the previous two studies were indicative of troublesome predicates. The reduction in the required amount of predicates for 6 statements allows the removal or alteration of these troublesome predicates. The revised 6 statement scales for each of the issues are illustrated in Figures 4.8, 4.9 and 4.10 below.
A. Abortion is extremely morally acceptable and should be available as a choice and encouraged in all circumstances
B. Abortion is very morally acceptable and should be available as a choice in all circumstances and sometimes encouraged
C. Abortion is morally acceptable and should be available as a choice in some circumstances
D. Abortion is immoral and should be prohibited in most circumstances
E. Abortion is very immoral and should always be prohibited and treated as a criminal offence in most circumstances
F. Abortion is extremely immoral and should always be strongly prohibited and treated as a despicable form of murder in all circumstances

Figure 4.8. Binary tree and resulting statements for the morality of abortion issue.
A. Euthanasia is extremely morally acceptable and should be available as a choice and encouraged in all circumstances

B. Euthanasia is very morally acceptable and should be available as a choice in all circumstances and sometimes encouraged

C. Euthanasia is morally acceptable and should be available as a choice in some circumstances

D. Euthanasia is immoral and should be prohibited in most circumstances

E. Euthanasia is very immoral and should always be prohibited and treated as a criminal offence in most circumstances

F. Euthanasia is extremely immoral and should always be strongly prohibited and treated as a despicable form of murder in all circumstances

*Figure 4.9.* Binary tree and resulting statements for the morality of euthanasia issue.
A. Aboriginal Australians should be given the utmost help to become more equal and thus deserve far greater economic assistance and ownership of their sacred lands
B. Aboriginal Australians should be significantly helped to become more equal and thus deserve greater economic assistance and free use of their sacred lands
C. Aboriginal Australians should generally be helped to become more equal, but some receive more economic assistance than they deserve
D. Aboriginal Australians should not be helped to become more equal as they are responsible for their own disadvantage in most circumstances
E. Aboriginal Australians should definitely not be helped to become more equal as they are always responsible for their own disadvantage
F. Aboriginal Australians should definitely never be helped to become more equal as they are always responsible for their own disadvantage and they are inferior

Figure 4.10. Binary tree and resulting statements for the equality of Aboriginal Australians issue.
Again, with the exception of the kernel concept, the semantic content of the abortion and euthanasia statements is identical. Firstly, the initial bifurcation is emphasised by changing ‘morally unacceptable’ to ‘immoral’ as according to semantic intuition the latter is more clearly negative. Also, the ordering of the statements is introduced into the initial bifurcation by adding the adverb ‘extremely’ to Statements A and F, and adding the adverb ‘very’ to Statements B and E. The troublesome ‘should be encouraged’ predicate is changed to ‘should always be encouraged’ so that the mutually contrary predicate is ‘should not always be encouraged’. To ensure the correct perception of the ordering of Statements B and C, this predicate is expressed as ‘sometimes encouraged’, emphasising the moderately favourable nature of the former. The ‘treated as a form of murder’ predicate is changed to ‘always treated as a form of murder’ and a degree of license is taken in expressing its contrary predicate as ‘treated as a criminal offence in most circumstances’ to emphasise Statement E as moderately unfavourable in nature, and more unfavourable than Statement D. Similarly, the ‘not always prohibited’ predicate of Statement D is expressed as ‘prohibited in most circumstances’ to emphasise its moderately unfavourable nature and to more clearly order it with respect to Statement C.

For the Aboriginal Australians statements, the ordering is introduced into the initial bifurcation by emphasising the level of help to be given according to their order in Statements A, B and C, and by emphasising how adamant each is that help should not be given according to the proposed order in Statements D, E and F. The troublesome ‘can understand their anger’ predicate is completely removed. Statement D’s moderately unfavourable nature is emphasised by expressing ‘not always responsible for their own disadvantage’ as ‘responsible for their own disadvantage in
most circumstances’. The ordering of Statement E relative to Statement D is emphasised by excluding the ‘not inferior’ predicate from its final expression.

In this study, the pair comparison task will involve preference judgements, as these are necessary for confirming Coombs’ (1964) model and in turn establishing the location of the statements. The alterations to the statements described above are predicted to result in a clearer ordering of the statements, which should result in substantially fewer folding errors than the previous study. Additionally, the shorter and less laborious pair comparison task is predicted to result in considerably fewer intransitive judgements than Study 2. Finally, the locations of the statements for each of the issues are expected to be fairly spread along the attitude dimension, with Statement C located proximal to the centre.

4.10.1 Method

Participants

All participants ($n=50$) were first-year Psychology students at the University of Sydney who received partial course credit. There were 30 females and 20 males and the mean age was 19.52 ($SD = 3.47$). 33 of the 50 participants indicated English was their first language and 46 indicated English was their best language. The Mean rating of their ability to understand English was 4.74 out of 5 ($SD = .49$).
Materials

The main materials were the attitude scales presented in Section 4.6. The questionnaires were presented via computer using the Quask Formartist survey software (http://www.quask.com). Participants indicated their preferences of the attitude scale statements via pair comparison judgements. The pair comparisons were counterbalanced using the optimum orders of Ross (1939).

Procedure

The procedure was identical to the pair comparison task of Study 2.

4.11 Results and Discussion

As predicted, the revised statements manifested far fewer erroneous preference judgements even with the inclusion of single-path errors. The frequencies of the intransitive judgement, folding and single-path errors across the 15 statement pairs for each of the issues are presented in Table 4.2 below. Overall, for the abortion issue, 26 (3.47%) out of 750 judgements were inconsistent with Coombs’ (1964) model. For the euthanasia issue, 24 (3.2%) judgements were erroneous. For the Aboriginal Australians issue, 22 (2.93%) judgements were erroneous. This is an average error rate of 3.2% across the three issues, which is a remarkable finding for a psychological theory considering that only one intransitive, folding or single-path error committed by each individual would have constituted an error rate of 6.67%. Such results are typical for statements constructed using this rigorous method and testify to the importance of stimulus control (Davies, 2004; Michell, 1994, 1998).
Table 4.2

*Frequencies of intransitive judgement (Int.), folding (F.) and single-path (SP) errors for each of the statement pairs for the abortion (AN), euthanasia (EU) and Aboriginal Australians (AA) issues.*

<table>
<thead>
<tr>
<th>Statement Pairs</th>
<th>AN</th>
<th>EU</th>
<th>AA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Int.</td>
<td>F.</td>
<td>SP</td>
</tr>
<tr>
<td>AB</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>AC</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>AD</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>AE</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>AF</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BC</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BD</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BE</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF</td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>CD</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CE</td>
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<td>DF</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EF</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>

For the abortion issue, 13 (1.73%) judgements were intransitive, constituting 50% of the overall error rate. The BF statement pair demonstrated the highest prevalence of intransitive judgements. Seven (0.93%) judgements were folding...
errors, constituting 27% of the overall error rate. Five of these errors involved the EF statement pair. Finally, there were 6 (0.8%) single-path errors, constituting 23% of the overall error rate. There was no clear localization of these errors.

For the euthanasia issue, 14 (1.87%) judgements were intransitive, composing 58% of the overall error rate. Again, the highest prevalence was for the BF statement pair. A single (0.13%) judgement was in violation of the folding condition, making up 4% of the overall error rate. Nine (2.67%) judgements were in violation of the single-path condition, constituting 38% of the overall error rate. The single-path errors were most prevalent with the AF and BC statement pairs.

For the Aboriginal Australians issue, 6 (0.8%) judgements were intransitive, constituting 27% of the overall error rate. There was no clear localization of these errors. A total of 9 (2.67%) judgements were in violation of the folding condition, making up 41% of the overall error rate. These were most prevalent for the DE statement pair. Seven (0.93%) judgements were single-path errors, composing 32% of the overall error rate. Three of these errors involved the AF pair.

These acceptable error rates allowed the establishment of the midpoint orderings. These are presented in Figures 4.11, 4.12 and 4.13 below. These figures also demonstrate the frequency of each preference order across the three issues. The 3 sets of midpoint orderings were then submitted to a test of double cancellation, presented in Figures 4.14, 4.15 and 4.16 below. All three issues’ midpoint orderings satisfied the double cancellation condition as the middle arrow never opposed the direction of both of the outside arrows and hence there were no contradictions entailed by them. This permitted an ordered metric solution using the Goode-Phillips algorithm from which the statement locations were obtained (Phillips, 1971). These solutions are presented at the bottom of Figures 4.11, 4.12 and 4.13.
Figure 4.11. The single-path through the proximity graph for the abortion issue with black arrows marking the dominant path and green arrows marking the arbitrary path, the frequency of the preference orders and the ordered-metric solution obtained from the midpoint ordering.
Figure 4.12. The single-path through the proximity graph for the euthanasia issue with black arrows marking the dominant path and green arrows marking the arbitrary path, the frequency of the preference orders and the ordered-metric solution obtained from the midpoint ordering.
Figure 4.13. The single-path through the proximity graph for the Aboriginal Australians issue with black arrows marking the dominant path and green arrows marking the arbitrary path, the frequency of the preference orders and the ordered-metric solution obtained from the midpoint ordering.
Figure 4.14. Tests of double cancellation for the morality of abortion issue.

Figure 4.15. Tests of double cancellation for the morality of euthanasia issue.
As can be seen from the above findings, in line with predictions, there was a sharp reduction in erroneous judgements across the three issues. The average intransitive judgement rate fell from 4.38% to 1.47%. It seems a reasonable explanation that the reduction of the number of items and in turn the number of pair comparisons reduced the cognitive load placed on the participants and the shorter task time allowed for more sustained attention. Of this 1.47%, 30% involved the BF statement pair. All of the individuals who made this intransitive judgement indicated their ideal point as most proximal to Statement C’s location, indicating their location proximal to the centre of the attitude dimension. This location situates them close to the BF midpoint and so their ideal point would only have to slightly ‘wander’ to lead to this intransitive judgement. The finding that the BF statement pair for the Aboriginal Australians issue was only misjudged once and the BF midpoint is
considerably closer to the unfavourable end of its dimension reinforces this interpretation. Nonetheless, such a low intransitive judgement rate is quite remarkable support for Coombs’ (1964) model and is also attributable to the much clearer ordering of the statements, which was also demonstrated by the low folding error rate.

The average folding error rate fell from 4.5% in Study 2 to 1.24% in Study 3. Surprisingly, these errors were predominantly committed with respect to statement pairs in the moderate to extreme locations of the dimension, as the locations of such items are normally more fixed for individuals. These errors may be alleviated in the future by further emphasising the semantic ordering of these pairs of statements. However, the overall level of error is not perceived as high enough to warrant further revision to the scales in this thesis.

The ordered metric solutions and the resulting statement locations were also reasonably consistent with predictions, particularly for the abortion and euthanasia issues. For the three issues, the statements were reasonably spread across the dimension, with the exception of the moderately favourable part of the dimension for the euthanasia issue. It appears that for this issue, Statement B is interpreted as more extremely favourable than expected. This may follow from the fact that the semantic weight of the predicate ‘sometimes encouraged’ leads to the interpretation of the statement as extremely favourable as participants believe the encouragement of euthanasia under any circumstances represents an extremely favourable attitude. Euthanasia is a sensitive issue and the prospect that individuals could be encouraged to seek a medically assisted death may offend people’s beliefs that it is a deeply personal decision and alert their fears that such a practice may be abused as a form of murder.
Crucially, for the abortion and euthanasia issues, Statement C was found to be located very close to the centre of the dimension. Given the intended ambivalent nature of this statement, this provides further support for the discussion of last chapter that the attitude dimension varies in a unidimensional, bipolar manner with ambivalent attitudes located toward the centre.

This relationship was not as clear for the Aboriginal Australians issue where Statement C was located at more moderately favourable position on the dimension. However, this finding must be interpreted with caution, as the ordered metric solution for this issue is the most questionable given the highly arbitrary nature of the single-path fit. Five of the 15 steps along the single path were defined arbitrarily as there were no preference orders at that position of the proximity graph. Furthermore, a number of the other steps were contingent upon the preference orders of a very small proportion of the participants as approximately 60% of responses were consistent with only two preference orders, BACDEF and CBADFE. Thus, a more reliable solution requires a wider spread of preference orders, which will ideally be achieved in the next chapter with a larger sample size.

It may also be the case that the semantic weight of the ‘some receive greater economic assistance than they deserve’ predicate of Statement C may not be as unfavourable as predicted. This is a commonly held belief regarding Aboriginal Australians, as illustrated in Section 3.4, and so it may not be interpreted as a ‘realistic’ evaluation rather than a particularly unfavourable one. In addition, individuals may feel favourable toward helping Aboriginal Australians to become more equal despite the fact that they feel that some abuse this help. Thus, they consider their attitude moderately favourable despite that belief, and hence such a statement would express a moderately favourable attitude.
Nonetheless, individuals who feel their attitude is more ambivalent than this statement may indicate this mixed nature of the attitude through their entire preference order, not just their indication of the statement closest to their ideal point. For example, an ambivalent attitude may provide a preference order of CDBEAF, which is located at the centre of the dimension. Whereas a moderately positive individual may provide the preference order CBADFE. Hence, the information present in the complete preference orders is far richer than just the most preferred statement.

4.12 General discussion

As can be seen from the progression of the studies in this chapter as well as the pilots presented in Appendix D, the construction of clearly ordered statements appropriate for a test of Coombs’ (164) deterministic theory is a laborious process. This is the even the case with the stimulus control provided by the binary tree procedure. Thus, it is unsurprising that most attitude researchers take a somewhat haphazard approach to scale construction and rely upon a tautological model such as the method of summated ratings, or utilise a probabilistic model, such as the HCM employed in Chapter 2.

4.12.1 The paradox of error in psychometric models

One of the largest shortcomings of the probabilistic approach is that by integrating error into the models, systematic accounts of the causes of error in psychometric studies have mostly been precluded (Michell, 1994). The progression from Study 2 to Study 3 was done on the basis of such an account, and the success of Study 3
provides evidence that the errors were systematic. Specifically, the significant reduction in intransitive judgements across the two studies provided evidence that the amount of cognitive effort required by the larger amount of pair comparisons and semantic complexity of the statements led to inconsistent preference judgements. Furthermore, the accentuation of the ordering of, and removal of troublesome predicates from the statements of Study 3 led to significantly fewer folding errors. Thus, providing evidence that these factors would have influenced the unacceptable level of these errors in Study 2. If the typical psychometric approach had been taken, these sorts of errors may have been dismissed as artifacts of chance.

In defense of the probabilistic approach, Andrich (2003) makes the observation that probabilistic models increase the precision of measurement. The rationale of his argument is that fit to deterministic models, such as Guttman’s (1944), are typically achieved by measures where the items are well spread on the underlying dimensions. This was demonstrated in the present chapter to a certain extent, as its deterministic approach led to the reduction of the number of statements, which in turn led to a reduction in the number of possible preference orders. Thus, the ability of the measure to differentiate between different, but close attitudes was reduced. The Aboriginal Australians scale, whereby 60% of the participants provided only two preference orders, provided an extreme example of this.

The precision of the measurement could perhaps be improved by increasing the amount of items, particularly located around the area of the dimension where participants were clustered. The response patterns could then be analysed using a probabilistic model that would be more tolerant of the resulting ordering violations. These would manifest from the subtler semantic ordering of the statements, which creates ambiguity. However, the notion that the integration of error in to the model
increases the precision of measurement is what Michell (2008a) refers to as a paradox in psychometric theory.

Typically, scientific models, such as those found in physics, increase the precision of their measurements by reducing the contaminating effect of error. If errors were completely removed the measurement would be, by definition, perfect. On the other hand in psychology, Andrich (2003) argues that the removal of error decreases the precision of measurement. It should be noted, as Andrich points out, that quantum physics provides an example whereby similar probabilistic models are utilised in the natural sciences. However, the use of such models in quantum physics is not a result of observations consistently being at odds with the proposed mechanisms of the system. Rather, they are used because the nature of the system is understood as inherently probabilistic.6

One is free to speculate that psychological phenomena are equally probabilistic, but this should be done in light of the fact that the collection of particles at the atomic level, let alone the human level, appears ‘large’ enough to be explained by the deterministic laws of classical physics (Rae, 2005). Furthermore, such a speculation should be accompanied by a theory of how the probabilistic features of the model correspond to the probabilistic aspects of the relevant psychological process. The fact that no such theory is ever provided is symptomatic of the lack of rigorous cognitive theory of such phenomena as social attitudes (Michell, 2008b).

Equally troubling is the fact that the assumptions regarding error normally provide the basis to the quantitative assumption of the model (Michell, 2004a, 2008a).

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6 This is also a point of contention as some interpretations of quantum physics, such as Bohm’s (1952), argue that quantum phenomena are not probabilistic in nature.
That is, we presume quantitative structure on the basis of the thing we know the least about. This is particularly concerning as tests of fit of such models have been shown to be insensitive to violations of the quantitative assumption (Kyngdon & Richards, 2007). If psychological measurement is going to progress from its dubious operationalist basis, tests of quantitivity, such as those presented in this chapter in a deterministic context, need to be integrated into these models. Karabatsos (2001), Humphry (2005) and Kyngdon and Richards (2007) have begun the work toward this end.

Nonetheless, Andrich (2003) makes a valid point that the fit of deterministic models often leads to ‘crude’ measures in psychology. However, a satisfactory solution does not appear to be provided by probabilistic models. Rather, greater precision in measurement must be developed out of greater precision in our understanding of the constructs and how they causally relate to our measures of them. For example, if it is ultimately revealed that attitudes are purely ordinally structured, violations of the single-path condition of Coombs (1964) model should not be considered erroneous at all, as the participants are accurately indicating that there is no strict ordering of the inter-statement midpoints. If the best we can do is order individual’s attitudes, then this should not be considered imprecise, as our instruments will accurately reflect the construct. In that case, our time would be better invested in understanding what determines this ordering so that this could be integrated in to the construction of the instrument to bring about more precise orderings.

Given the multitude of extraneous factors that affect questionnaire responses, it seems inevitable that violations of model assumptions will always be found. This chapter attempts to provide systematic explanations of the causes of such violations.
throughout the studies. Whilst these explanations may not be accurate, they at least escape the psychometric habit of obscuring them under the cloak of error and may provide future avenues for improvement. Furthermore, without this consideration of the causes of error, the statements in this chapter could not have progressed to a form where they are judged in a manner almost entirely consistent with Coombs’ (1964) model. This, in turn, provided genuine evidence that ambivalent attitudes fit within a unidimensional, bipolar and quantitative dimension.

4.12.2 Conclusion

This chapter’s confirmation of the bipolar and quantitative assumptions affirms the possibility of true quantitative attitude measurement, including the assessment of ambivalent individuals. This finding is crucial for the statistical analyses to be used in Chapter 5. Furthermore, this approach conceptualized ambivalence as a property of evaluative judgements, located at the centre of the evaluative dimension. The measures validated in this chapter reflect this conceptualisation. Thus, there is an opportunity to examine the relationship between these measures and subjective reports of ambivalence to provide further validation of them. Furthermore, the greater rigour of the measures and the insights provided by the unfolding approach provide the opportunity to further investigate the relationship between ambivalence and latent attitude parameters free from the influence of operationalist biases. These issues will be the focus of Chapter 5.
Chapter 5 - The Conceptualisation of Attitudinal Ambivalence

5.1 Introduction

So far, this thesis has investigated the implications of ambivalence for the conceptualisation and measurement of attitudes generally. This work has been psychometrically focussed and has provided evidence that ambivalence is consistent with both the bipolar and quantitative assumptions and guided the construction of measures of a number of attitudes. These measures have been validated as reflecting these structural assumptions. Furthermore, they represent ambivalence as mixed evaluative judgements located at the centre of the evaluative dimension. This chapter will attempt to provide further validation of these measures and conceptualisation by examining their relationship with subjective reports of ambivalence. This will shift the focus to a critical consideration of the conceptualisation of ambivalence in the literature and its relationship with a number of attitude parameters. This conceptualisation of ambivalence is intrinsically linked to the psychometric issues raised in earlier chapters, as it has been driven by the measurement approaches. This is unsurprising given the aforementioned operationalist bias that pervades attitude research.

This operationalist approach has led ambivalence researchers to identify two forms of ambivalence, which were introduced in Chapter 1. These have been referred to in the literature as objective and subjective, potential and felt, direct and indirect, or meta-psychological and operative (Fazio & Olson, 2003; Holbrook, & Krosnick,
They stem from the distinction between the direct assessment of ambivalence, whereby individuals are directly asked how ambivalent their attitude toward the issue is, and indirect assessment, whereby individuals are asked to independently indicate how positive and how negative they feel toward the issue. Evidence for the independence of these constructs has mostly been provided by the lack of inter-correlation between these distinct measurement approaches (Holbrook & Krosnick, 2005; Priester & Petty, 1996; Thompson et al., 1995). However, this evidence is undermined by the influence of operationism. This influence has led these researchers to forget what they are referring to when they investigate ambivalence.

It will be argued in this chapter that the above conceptualisation is at odds with the most basic understanding of ambivalence as a property of an attitude, not a standalone construct. The previous chapters demonstrated how ambivalence fits within the general bipolar conceptualisation and measurement of attitudes using an unfolding approach. In line with this understanding, the conceptualisation of ambivalence and the relationship between different measures of it will be investigated in terms of a number of attitude parameters.

The importance of the attitude intensity parameter was discussed in Chapter 2, particularly with respect to differentiating ambivalence from indifference. Additionally, this chapter will explore the relevance of the latitude of acceptance parameter, which has been addressed in a number of other attitude contexts and appears relevant to an understanding of ambivalence. These parameters will be elucidated in terms of the response function of the unfolding models. However, before presenting the details of these parameters and the proposed model, this
chapter will review and critique the dominant conceptualisation of ambivalence in the attitude literature.

5.2 Operationism and the conceptualisation of ambivalence

5.2.1 Operationism and Psychology

Bridgman (1927) introduced operationism as a philosophy of science. He argued that physical concepts should not be defined in terms of their properties, but rather in terms of the operations used to measure and manipulate them. So, the physical concepts such as length, mass, weight etc. are not understood as objective properties in space-time, but rather in terms of the operations we perform on them. He saw this as a way of eradicating what he labelled as abstract, metaphysical concepts from science, which had led to the crisis in physics as a result of Einstein’s relativistic revolution (Grace, 2001). Bridgman’s proposal was bolstered by its enthusiastic acceptance by the Logical Positivists, who were a major force in the philosophy of science at the time and shared a common goal of eradicating ‘metaphysics’ from scientific theories (Bickhard, 2001).

Within a decade, the philosophy of science community, including the logical positivists, abandoned operationism as a viable theory. One of the most debilitating criticisms was almost immediately provided by Russell (1928, cited in Green, 2001) and reiterated by Suppe (1977). This criticism points out that an absurd consequence of operationism is that it leads to a multiplication of theoretical terms. Taking length for example, operationism leads to the conclusion that a length measured by a ruler is entirely distinct from a length measured by triangulation, and is entirely distinct from a length measured by any other operation. That is, these ‘lengths’ are distinct in the
way that length differs from mass. They are literally different concepts. Furthermore, Michell (1999) highlights the logical error of operationism as it seeks to confound the thing being measured with how it is measured. The fact that something may be identified using a certain operation does not logically entail that it cannot exist without being identified by that operation. Despite these fundamental flaws, operationism continues to influence psychology, albeit in a diluted fashion.

Operationism was ushered into psychology by Stevens (1935) amongst others. As previously discussed in Chapter 1, Stevens utilised it as a justification for his revised definition of measurement (Michell, 1999). Other psychologists rapidly adopted it as it provided justification for the fledgling experimental practices of the dominant behaviourist school at the time (Grace, 2001; Michell, 1999). In addition, it would later justify the use of classical test theory, which had a profound effect upon psychological testing, especially in the realm of mental abilities (Borsboom, 2005).

It appears that some psychologists took the tenets of operationism literally, such as Boring (1923, p. 187) who famously wrote, “Intelligence is what the tests test”. Curiously, this predates Bridgman’s (1927) formalisation of operationism, demonstrating the readiness to adopt this principle. However, such a literal adaptation of operationism is rendered untenable by the above criticisms. It is fallacious to confound what is being measured with how it is being measured. Despite this, evidence of its effect may be identified throughout the attitude literature and particularly in the dominant understanding of ambivalence.
5.2.2 Operationism and the two forms of ambivalence

As introduced in Chapter 1, researchers have typically approached the assessment of ambivalence in one of two ways. Firstly, researchers have assessed what they term felt/subjective/direct/meta-psychological ambivalence, which involves directly asking individuals how conflicted/ambivalent/mixed they feel toward an attitude issue. Secondly, they have assessed what they term potential/objective/indirect/operative ambivalence by asking respondents to independently rate how positive and how negative they feel toward an issue and these two ratings are combined into an ambivalence score using a pre-determined formula, such as the Similarity-Intensity Model (SIM), which was reviewed in Section 1.6.

Upon calculating this score, researchers have typically assessed its validity by comparing it with a subjective measure as the criterion. More often than not, this involves correlating the two scores and the correlation is typically only small to moderate in size (Holbrook & Krosnick, 2005; Priester & Petty, 1996; Thompson et al., 1995). Conclusions are then drawn regarding the nature of these ‘ambivalences’ as independent constructs.

However, such a conclusion is not valid given the nature of the analysis employed. Firstly, it does not account for the attenuating effect of error on such inter-correlations. Secondly, it appears to be influenced by a literal operationalist mentality, whereby measures are taken to be equivalent to the underlying constructs. Holbrook and Krosnick (2005) were the first to extend upon this approach utilising a latent variable model.
5.2.3 Operationism and the two ambivalences as latent variables

Despite the pervasive effect of operationism upon psychology, a number of statistical analytical approaches have been developed that account for the imperfect nature of measures as indicators of latent psychological variables. The most widely utilised of these has been the factor analytic procedure introduced by Spearman (1904). More recently, the statistical technique of structural equation modelling, which combines path analysis, factor analysis and simultaneous equation modelling, has received increasingly widespread attention within the social sciences (Hoyle, 1995; Jöreskog, 1973; Kaplan, 2000). Despite the widespread usage of these approaches in other areas of Psychology, ambivalence researchers have predominantly ignored them.

Holbrook and Krosnick (2005) were the first to extend upon the abovementioned correlational approach by examining the relationship between the two hypothesised ambivalences using confirmatory factor analysis. They defined the two approaches as assessing meta-psychological and operative ambivalence and argued that these are distinct, but related constructs. Their analyses provided a two-factor solution across a number of issues, supporting their assertion that these are independent latent variables. The distinction between these latent variables will be discussed in greater detail in Section 5.3.

Whilst improving upon the correlational approaches that preceded it, Holbrook and Krosnick’s (2005) analyses may still be criticised as being undermined by operationism. Specifically, because the operative scores that underpin their operative ambivalence variable are framed in terms of the assessment of

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7 Although latent variable approaches are positively reviewed in this context as they lend themselves to realist interpretations of psychological variables, they also make a number of assumptions that are not routinely checked (MacCallum & Austin, 2000). These assumptions will be overviewed in Section 5.6.4.
ambivalence, the underlying construct is conceptualised as ambivalence. This may be perpetuated by their use of the Gradual Threshold Model (Priester & Petty, 1996) and the Negative Acceleration Model (Scott, 1966) as the operative scores in their analyses.

Both of these models take as their premise that ambivalence is a feature of the positive and negative ratings provided on the unipolar scales illustrated in Figure 1.1. Thus, there is no attempt to conceptualise ambivalence with respect to the underlying construct(s) that causally influence these ratings. Rather, the focus is upon the nature of the relationship between the ratings provided and the extent of the conflict between them. Clearly, this literature needs to move away from these operationalist underpinnings and extend the understanding of ambivalence to the latent attitude level.

Curiously, despite addressing the SIM in their literature review, Holbrook and Krosnick (2005) do not include it in their analyses. This is detrimental as the SIM is the only ambivalence formula that is explicitly derived from a theoretical consideration, however limited, of the attitude parameters that potentially underpin the positive and negative ratings. What the SIM makes explicit, at least in its derivation, is that ambivalence is not a stand-alone construct. Rather, it is a property of an attitude (Thompson et al., 1995). What Holbrook and Krosnick (2005) and the ambivalence literature in general have failed to acknowledge is that as ambivalence is a property of an attitude, it should be investigated in terms of general attitude parameters as the latent constructs. Consideration of the components of the SIM provides a starting place for a conceptual understanding of ambivalence in terms of the underlying attitude parameters.
5.3 Ambivalence as a property of latent attitude parameters

5.3.1 The SIM, similarity and ambivalence

As previously discussed, the SIM identifies ‘similarity’ and ‘intensity’ as the attitude components most relevant to ambivalence. Despite being titled in operative terms, it can be elucidated from Thompson et al.’s (1995) discussion that the similarity component refers to the person’s location on the evaluative dimension. This is the most common parameter addressed in attitude research.

Specifically, it pertains to the polarity of the location of the individual’s attitude on the evaluative dimension. As Thompson et al. (1995, p. 367) state, “as the difference in magnitude between the two components increases (i.e., the similarity in the magnitude between the two components decreases), the attitude becomes more polarised in the direction of the stronger component.” Therefore, rather than referring to the similarity between the ratings of positivity and negativity, in latent variable terms, similarity is understood as a non-polarised (i.e., proximal to the centre) location on the evaluative dimension. This understanding is akin to the conceptualisation of the bipolar evaluative dimension and the place of ambivalence in it that was elaborated and investigated in the previous chapters.

5.3.2 The SIM, intensity and ambivalence

Thompson et al.’s (1995) inclusion of the intensity component in the SIM model acknowledges the calls of a number of attitude researchers to pay more attention to what they term ‘attitude strength’ parameters (Krosnick et al., 1993; Petty & Krosnick, 1995). Components of attitude strength have been found to influence an attitude’s persistence over time, resistance to change, and influence on thought and
action over and above a person’s location on the evaluative dimension (Visser, Bizer & Krosnick, 2006). The strength parameters include attitude intensity, certainty, importance, accessibility, knowledge and the latitudes of acceptance, rejection and non-commitment, amongst others. It appears that it is these strength parameters that pertain to the intensity component of the SIM model.

However, Thompson et al. (1995) are never explicit about what they take this parameter to be in terms of a latent construct. Rather, they refer to it in operative terms as the extremity of the ratings provided. To further complicate matters, there is an ongoing debate within the attitude strength literature as to whether it should be considered a unitary construct, or rather composed of many interrelated constructs (Krosnick et al., 1993, Visser et al., 2006). But, it will be inferred from the title given to this aspect of Thompson et al.’s (1995) model that they were referring to the attitude intensity parameter.

Krosnick et al. (1993, p. 1132) define attitude intensity as, “the strength of the emotional reactions provoked by the attitude object in the individual.” Items that assess attitude intensity typically ask individuals to indicate how strongly or intense they feel toward an issue (Krosnick et al., 1993; Visser et al., 2006). This is crucial, as when discussing the details of an ambivalence formula that influenced the SIM, Thompson et al. (1995, p. 368) state, “in order to reward…intensity even more (or to penalize indifference)”. Thus, they allude to their understanding of an intense attitude as being the counterpart to indifference. A person who is indifferent toward an issue does not care about it. There is no intensity or strength to his or her feelings regarding the issue.

Some researchers have treated attitude extremity and intensity as interchangeable (McDill, 1959; Tannenbaum, 1956). This is of interest because it
suggests that the similarity and intensity components of the SIM may in fact be underpinned by a single variable, i.e., location on the evaluative dimension. That is, as an attitude polarises in either direction the positivity and negativity become less similar and the intensity increases. However, Davies (2004) found that attitude extremity and intensity were only lowly correlated, and that variation in intensity was present across the entire evaluative dimension, including moderate and extreme locations. Thus, extremity and intensity, although related, appear to constitute different elements of an attitude.

Furthermore, Davies (2004) investigated the hypothesis that attitude intensity, understood as the level of caring toward an issue, is associated with the extremity of responses on rating scales toward the issue, the operative understanding of intensity put forth by Thompson et al. (1995). Her findings indicated a strong, positive correlation between the two. Thus, it seems reasonable to investigate the attitude intensity parameter as the variable underpinning this aspect of the SIM.

Interestingly, the parameters identified in the SIM are inherent within the interpretation of the single-peaked preference function argued to underpin rating scale responses by Michell (2001b) and later elaborated by Davies (2004). This preference function not only captures the similarity and intensity components of the SIM, understood in latent variable terms, but also adds the latitude of acceptance parameter.
5.3.3 The single-peaked preference function and ambivalence

Figure 5.1. Single-peaked preference function illustrating the conceptualisation of the evaluation, intensity and latitude of acceptance parameters.

Davies (2004), extending upon the ideas of Michell (2001b), postulated that rating scale responses are determined by the parameters of a person’s single-peaked preference function (see Figure 5.1 above for an illustration of this preference function). She highlights three components of the preference function. Firstly, the person’s location on the evaluative dimension, or their ideal point in Coombs’ (1964)
terms. This is typically the only parameter considered in attitude research and in the interpretation of rating responses, including research applying unfolding analysis. Secondly, the height of their preference function, which indicates how strongly or intensely their attitude is felt. Thirdly, the slope of the preference function, which is determined by their level of agreement with other attitude positions. This is commonly referred to as the individual’s latitude of acceptance. Consequently, two individuals may share a common ideal point on the evaluative dimension, but their attitudes may still differ in terms of either their intensity or the number of other attitude positions they also agree with.

Thus, when rating an item, a person will agree with it if it is sufficiently proximal to their ideal-point, i.e., it is within the bounds of their latitude of acceptance. Furthermore, for the item deemed closest to their ideal point, the extremity of this agreement will be determined by the intensity of their attitude. So, in terms of translating the SIM to this context, an ambivalent individual’s ideal-point will be located toward the centre of the evaluative dimension and their preference function will be sufficiently high to indicate that they are not indifferent toward the issue, i.e., their attitude is sufficiently intense. Interestingly, the one parameter in Davies’ (2004) conceptualisation that is not addressed by the SIM is the latitude of acceptance. At face value, this parameter seems relevant to the manifestation of ambivalence in attitude structure.

5.3.4 The latitude of acceptance parameter and ambivalence

The latitude of acceptance parameter was first investigated in a Social-Judgment theory context, whereby it was defined as the extent of the positions acceptable to an
individual in addition to their most acceptable position (Hovland, Harvey & Sherif, 1957; Sherif & Hovland, 1961; Sherif, Sherif & Nebergall, 1965). They found that individuals tended to not just agree with one particular item. Rather, they indicated varying levels of agreement with a number of items across a certain area of the evaluative dimension.

This parameter has been mostly ignored in the mainstream attitude literature, which may be attributable to the field’s predisposition to treat attitudes as a single point on a single evaluative dimension (Krosnick et al., 1993). However, this parameter has been given more thorough consideration within the unfolding context, which does not always display the same predisposition (Andrich & Luo, 1993; Andrich, 1996; Coombs, 1964; Davies, 2004; Johnson, 2007; Luo, 1998; Luo, Andrich & Styles, 1998). For example, in Coombs’ (1964) unidimensional unfolding theory, he argues that an individual will agree with an item if the distance between their ideal point and the location of the item is less than or equal to the person’s latitude of acceptance (this notion is illustrated in Figure 5.1 above). Thus, in both the social-judgment theorists’ and Coombs’ approaches, the latitude of acceptance is understood as a person parameter.

Recently, this parameter has been considered in research utilising the Hyperbolic Cosine Model (Andrich & Luo, 1993; Andrich, 1996; Luo, 1998; Luo, Andrich & Styles, 1998). This approach has predominantly understood the latitude of acceptance as an item parameter, whereby if an individual’s ideal point falls within the latitude of acceptance region surrounding an item, the probability of an agree response to it is greater than the probability of a disagree response. Thus, the greater the latitude of acceptance region of an item, the less discriminatory it is. However,
Luo, Andrich & Styles (1998) did offer a version of the generalised HCM whereby the latitude of acceptance is also understood as a person parameter.

This question of whether the latitude of acceptance should be understood as a person or item parameter is an important one for the current study as it wishes to examine this attitude parameter as a latent variable and thus adopts an understanding akin to the traditional view. That is, it is being examined as the tendency of a person to agree with attitudinal positions that may be different and even contrary to their own and thus is a person parameter. However, this item/person parameter distinction with respect to the latitude of acceptance seems rather moot given that items are designed as analogues of attitudes. If an attitude possesses a latitude of acceptance, then its analogous item should also possess such a latitude. Thus, this parameter should be given more consideration when attempting to understand individuals’ attitudes or constructing attitude items.

In addition, there has been controversy regarding the degree of distinction between the latitude of acceptance parameter and the extremity and intensity parameters and whether it should be understood as an independent component. Firstly, when initially considered, the latitude of acceptance parameter was understood as being inversely related to the extremity of one’s attitude, i.e., the further polarised your attitude, the smaller your latitude of acceptance (Diab, 1965; Sherif & Hovland, 1961). However, McCroskey (1968) demonstrated that these two parameters were only lowly correlated and that there was a wide range of latitudes observed in ‘neutral’ subjects. This is crucial as it provides evidence that there is variability in this parameter across individuals located toward the centre of the evaluative dimension and thus it appears independent of attitude extremity.
Secondly, Sherif and Hovland (1961) suggested that latitudes of acceptance are inversely related to attitude intensity. That is, individuals who care more about an issue will have smaller latitudes of acceptance than those who care less. Whilst this trend is consistent in aggregated data across a number of studies, Sherif (1960) found that there is variability in latitudes of acceptance across individuals of similar intensities. Thus, although the latitude of acceptance is likely highly related to the extremity and intensity parameters, given the above findings, it seems reasonable to investigate it as an independent parameter.

5.4 Relationships between these latent attitude parameters and meta-psychological ambivalence

As previously discussed, Holbrook and Krosnick (2005) found that the distinction between the operative and subjective forms of ambivalences in the literature was attributable to the fact that researchers were assessing two different latent variables by their different ambivalence measures. The first pertains to the level of conflict in an individual’s positive and negative judgements of an issue. This is what I have explained in latent variable terms as a property of an attitude. The second pertains to the subjective experience of ambivalence, which they describe as a meta-psychological judgement.

They term it this as when you ask someone how conflicted/ambivalent/mixed they feel about a particular issue, you are not attempting to assess their attitude. Rather, you are assessing a subjective judgement of that attitude. This is akin to the difference between assessing a person’s weight by putting them on a weighing scale versus asking for their judgement regarding how much they weigh. It
could be the case that the two coincide. However, it seems more likely that the latter would be determined not only by their actual weight, but also by other extraneous factors such as their body self-image, comparisons to their peers, influence by the media etc.

Typically in attitude assessment we are attempting to directly assess an attitude, understood in this context as an evaluative judgement regarding some object/issue. When we ask an individual to assess how ambivalent their attitude is we are asking for a judgement of the evaluative judgement, or in Holbrook and Krosnick’s (2005) terms, a meta-psychological judgement. Just as in the above example whereby one’s judgement of a physical state may be influenced by extraneous factors to that state, it is plausible that one’s judgement of a psychological state may be similarly affected.

In fact, Newby-Clark et al. (2002) demonstrated that meta-psychological ambivalence could be independently affected by an individual’s preference for cognitive consistency. Furthermore, Priester and Petty (2001) showed that it could be partially explained by attitude discrepancy with a liked other. Thus, it appears reasonable to assume that meta-psychological judgements of ambivalence, which will be referred to as meta-psychological ambivalence, are distinct from the ambivalence inherent in the parameters of an attitude.

However, despite these extraneous influences, past research studies utilising the Similarity-Intensity Model appear to suggest a significant determining relationship between the attitude parameters and meta-psychological ambivalence (Mucchi-Faina, Costarelli & Romili, 2002; Priester & Petty, 1996; Thompson et al., 1995). Of these, location on the evaluative dimension appears the most fundamental. The past chapters of this thesis have demonstrated that proximity to the centre of this
dimension is indicative of a mixed evaluative judgement. It seems unlikely that an individual would experience meta-psychological ambivalence if the attitude being evaluated did not possess this quality.

The attitude intensity and the latitude of acceptance parameters have received no empirical attention with respect to meta-psychological ambivalence. However, given the consistent finding that more extreme attitudes on the evaluative dimension tend to be more intense, and that extremity is negatively correlated with ambivalence, it appears reasonable to assume that overall intensity will have a negative relationship with meta-psychological ambivalence (Maio, Bell & Esses, 1996). In contrast, for individuals located toward the centre of the evaluative dimension, Thompson et al. (1995) suggest that greater intensity will lead to greater feelings of ambivalence.

With respect to the latitude of acceptance, given that ambivalent individuals are more likely to find both positive and negative attitudes agreeable, it seems reasonable to predict that larger latitudes will lead to greater feelings of ambivalence. This is particularly the case for individuals located toward the centre of the evaluative dimension. This is an important point, as if an individual possesses a large latitude of acceptance toward some issue, but is located toward the extremities of the dimension, then their stance might be more accurately understood as acquiescent rather than ambivalent.

5.5 Aims and hypotheses

Given the above overview, the study presented in this chapter firstly aims to further investigate the relationships between the evaluation, intensity and latitude of
acceptance attitude parameters. It is hypothesised that higher levels of intensity will be associated with more extreme positions on the evaluative dimension. Furthermore, it is hypothesised that locations on the evaluative dimension proximal to the centre will be associated with greater latitudes of acceptance. Finally, it is predicted that higher levels of intensity will be associated with smaller latitudes of acceptance.

More importantly, the study presented in this chapter intends to more rigorously examine the structural relationship between ambivalence as a property of these attitude parameters and as a meta-psychological judgement. In doing this, it will be the first to attempt to study this relationship free from operationalist biases. This will involve the adoption of a structural equation modelling (SEM) framework, which will be elaborated in Section 5.6.4. By using multiple indicators, this analytic method attempts to investigate the relationships between the latent variables of interest, rather than our measures of them.

It will initially parallel Holbrook and Krosnick’s (2005) analysis by fitting one and two-factor models to the data (see Figures 5.2 and 5.3 below). It is expected that, in line with the results of Holbrook and Krosnick, the two-factor model will possess a superior fit, highlighting the distinction between ambivalence as a property of an attitude and as a meta-psychological judgement. Furthermore, given that the evaluation, intensity and latitude of acceptance parameters are conceptually understood as independent constructs, a further model will be assessed containing independent latent variables for each (see Figure 5.4 below). It is expected that this model will display the best overall fit.

Furthermore, the three attitude parameters and their interactions will be investigated as predictors of meta-psychological ambivalence. It is hypothesised that the evaluation parameter will show the greatest predictive relationship, whereby
values proximal to the centre of the evaluative dimension will be associated with greater meta-psychological ambivalence. As this parameter will be predominantly indicated by the measures developed and validated in Chapters 3 and 4, it is expected that these results will further validate these measures by providing evidence that they are systematically related to meta-psychological ambivalence. In addition, a small but significant negative relationship between intensity and meta-psychological ambivalence and a small but significant positive relationship between the latitude of acceptance and meta-psychological ambivalence are predicted.

Finally, two interactions are predicted including, 1) evaluation $\times$ intensity, whereby the relationship between proximity to the centre of the evaluative dimension and meta-psychological ambivalence will be greater for individuals with more intense attitudes, and, 2) evaluation $\times$ latitude of acceptance, whereby the relationship between proximity to the centre of the evaluative dimension and meta-psychological ambivalence will be greater for individuals with larger latitudes of acceptance.

5.6 Method

5.6.1 Participants

All participants ($n=200$) were first-year Psychology students at the University of Sydney who received partial course credit in return for their participation. There were 125 females and 75 males and the mean age was 19.99 ($SD = 4.42$). 137 of the 200 participants (68.5%) indicated English was their first language and 183 (91.5%) indicated English was their best language. The Mean rating of their ability to understand English was 4.63 out of 5 ($SD = .59$).
5.6.2 Materials

The main materials were the 6-item morality of abortion, morality of euthanasia, and equality of Aboriginal Australians attitude scales developed in Chapter 4. Similar to Chapter 4, participants indicated their preference orders for each of the 3 issues via pair comparison judgements. In addition, ratings of agreement with the statements were obtained on a 9-point bipolar rating scale ranging from ‘strongly disagree’ to ‘strongly agree’ with ‘neither agree nor disagree’ at the centre. The pair comparisons were counterbalanced using the optimum orders of Ross (1939) and the order of the statements was counterbalanced across participants for the rating task.

Similar to the bivariate rating task outlined in Section 1.6, participants were also required to provide separate ratings of how positive and how negative their attitude was toward the issue on a 9-point rating scale anchored at one end by, ‘not at all positive/negative’, and at the other end by, ‘extremely positive/negative’. These two ratings were provided at different times, separated by a number of tasks.

In addition, participants reported their levels of attitude intensity on a single item using a 9-point, unipolar rating scale anchored at one end by the statement, ‘I am completely indifferent toward this issue’, and at the other end by the statement, ‘I care more about this issue than any other’. These anchoring descriptors were based upon the attitude intensity scale presented in Appendix E. Similarly, meta-psychological ambivalence was assessed using 3 items on a 9-point, unipolar rating scale. These items asked participants how ‘mixed’, ‘indecisive’ and ‘conflicted’ their attitudes were toward the issue and options on the rating scale ranged from ‘not at all’ to ‘extremely’. This approach is consistent with Holbrook and Krosnick (2005)
and a number of other ambivalence researchers and thus increases comparability with the current findings.

This study did not utilise the scales presented in Appendix E for the attitude intensity and meta-psychological ambivalence parameters for a number of reasons. Firstly, Davies (2004) provided evidence that ratings are a valid form of measurement when used to assess demonstrably quantitative variables. The results of Appendix E provided evidence that these parameters are quantitatively structured. Furthermore, as participants were already required to respond to a large number of different questions across three issues, it was deemed ideal to simplify these measures.

Latitude of acceptance was assessed utilising a task adopted from the work of the Social-Judgment theorists (Sherif et al., 1965). Participants were provided with a randomised list of the items and were initially required to indicate the item they agreed with the most. They were then required to indicate if they agreed with any other items. See Appendix A for sample screenshots and instructions for each of the tasks.

5.6.3 Measures

As will be discussed in Section 5.6.3, three indicators were required for each variable of interest. Given that the types of measures (e.g. ratings) can introduce systematic biases and these can be perpetuated when very similar indicators are utilised, the study will attempt to use scores derived from different methods (Green et al., 1993).
Mixed Evaluation

For the evaluation parameter, scores were obtained by analysing the preference orders from the pair comparison and rating tasks according to Coombs’ (1964) model. The findings regarding the assumptions of Coombs’ model and the scaling solutions are presented in Section 5.7.1 below. The scoring of the item-rating task was almost identical to the scoring of the pair comparisons overviewed in the previous chapter. Firstly, each individual’s preference order was extracted from his or her rating of each item. This complete set of preference orders was then used to scale the items.

The main difference in scoring the ratings was that they included preference orders with ties, i.e., an individual may provide the same rating of agreement for more than one item. Michell (1998) provides an extensive overview of how to deal with this and the procedure is best explained via an example. If an individual provides the preference order B(ACD)EF, with the brackets indicating that they provided equivalent ratings of items A, C and D, then their response does not differentiate between the BACDEF, BCDEF and BCDAEF preference orders. As a result, they are provided with the score that is the midpoint of the part of the scale covered by these three preference orders. This scoring is explained in greater detail in Appendix F.

Importantly, the scores extracted from both the pair comparison and item-rating tasks were inverted such that higher scores indicated greater proximity to the centre of the evaluative dimension. Thus, higher scores were indicative of a mixed evaluation. This was done as the analyses described in the section below will be investigating linear relationships between the attitude parameters and meta-psychological ambivalence and proximity to the centre of the evaluative dimension is
hypothesised to predict greater meta-psychological ambivalence. The pair-comparison derived score will be referred to as the ME CoombsPC measure and the item-rating derived score will be referred to as the ME CoombsRt measure.

The third score was derived from the bivariate ratings utilising the similarity formula from Thompson et al.’s (1995) similarity-intensity model. As discussed in Section 5.3.1, this score is understood to assess the person’s location on the evaluative dimension and particularly their proximity to its centre. Despite the fact that Chapter 1 was critical of this approach to assessing ambivalence, it was included in the study as it allowed for the comparison of scores derived from this methodology with scores obtained from an unfolding approach. This will be referred to as the ME SIM measure.

**Attitude Intensity**

The first indicator of the intensity parameter was the subjective rating of indifference described in the previous section. This will be referred to as the Int Sub measure. The second indicator was influenced by the above discussion of the work by Thompson et al. (1995) and Davies (2004), whereby the extremity of the rating provided was taken to be indicative of the intensity of the attitude. Specifically, in the item-rating task, the intensity score was derived from the rating given to the item most agreed with. This will be referred to as the Int Rate measure. The final intensity indicator was taken from the intensity component of the SIM formula to combine the positive and negative, bivariate ratings. This will be referred to as the Int SIM measure.
Latitude of Acceptance

The first indicator of the latitude of acceptance parameter was taken from the abovementioned Social-Judgment methodology. Scores were derived from the area covered by the item(s) agreed with on the scaling solution of the pair comparison task. This will be referred to as the LoA SJ measure. The second indicator was influenced by the aforementioned work of Davies (2004) and was similarly scored to the Social-Judgment method. However, the items agreed with were determined by the ratings provided on the item-rating task. Scores were then allocated according to the area covered by the item(s) agreed with on the scaling solution of the rating task. This will be referred to as the LoA Rate measure. The final indicator was taken from the mean of the ratings provided on the item-rating task. This seemed a sensible indicator as the greater the number of items given a high rating of agreement, the higher the mean score. This will be referred to as the LoA Mean Rate measure.

Meta-psychological ambivalence

The three indicators of meta-psychological ambivalence were provided by the ‘mixed’, ‘conflict’ and ‘indecision’ rating tasks described in the previous section. These will be referred to as the MPA Mixed, MPA Conflict and MPA indecision measures.

5.6.4 Analyses

Structural equation modelling (SEM) was selected as the analytic procedure as it is premised upon the acknowledgment that our measures are fallible indicators of the
psychological constructs by making the distinction between observed and latent variables (Kline, 1998). It investigates the relationships between latent variables by analysing the patterns of covariation between multiple observed indicators, which allows for an account of measurement error. This is in contrast to the operationalist analyses typically utilised to investigate ambivalence.

Moreover, SEM is advantageous as it is tolerant of correlated predictors and it allows for the confirmatory analysis of theoretical models as a whole, rather than just specific parameters. This test can be of a single model or between competing theoretical models and allows for more robust interpretations as the researcher has evidence regarding the correct specification of the model (Kline, 1998).

However, SEM does make a number of assumptions that should be addressed for its correct application. Primary to this thesis is the assumption that the latent psychological variables and in turn their observed indicators possess a quantitative structure. This assumption is rarely if ever tested and reasons for this may be traced to the previously discussed Pythagorean mindset in psychology, whereby everything in nature is considered to be quantitative at their core (Michell, 1999). Some researchers have provided solutions for dealing with ordinal or categorical observed variables including bootstrapping procedures and Bayesian analysis (Byrne, 2001; Lee, 2007). However, although these procedures may improve the robustness of the resulting statistics, they are still premised on the assumption that the underlying variables are quantitatively structured (Lee, 2007).

Other key assumptions include that the distribution of the individual variables in the model as well as the multivariate distribution of the variables should be normal, that the sample size is appropriately large to provide robust statistics, and
that the relationships between the variables should approximate linearity (Kline, 1998).

Procedurally, SEM involves two steps (McDonald & Ho, 2002). Firstly, the data is subjected to a confirmatory factor analysis, which tests what is termed the ‘measurement model’. This addresses the assumption that the indicators measure the corresponding latent variable. The researcher only moves on to fitting what is termed the ‘structural model’ once the measurement model has been validated. The structural model involves testing specific relationships between the latent variables, which are often causal in nature. Although it should be noted that the procedure is not specifically sensitive to the question of causality, and thus such conclusions should be driven by theoretical insight and judgement (Byrne, 2001).

The specific alternative measurement models for this chapter are set out in Figures 5.2, 5.3 and 5.4 below. In each Figure, the latent variables are represented in circles, including the error terms, and the observed indicators are represented in rectangles. Single-headed arrows indicate a causal relationship between the variables in the direction specified by the arrow. Double-headed arrows indicate covariation between the variables.

The first model captures the assumption that a single latent variable underpins the measures of the mixed evaluation, intensity and latitude of acceptance parameters as well as the measure of meta-psychological ambivalence (one-factor model). The second model is more akin to the work of Holbrook and Krosnick (2005) and represents the measures of the three attitude parameters as underpinned by a common latent variable and the meta-psychological ambivalence measure determined by a separate factor (two-factor model). The third model is consistent with the hypotheses of this chapter and the notion that ambivalence is a property of
the independent parameters of an attitude and not a latent psychological construct unto itself. Figure 5.4 represents the measures of each of the attitude parameters and meta-psychological ambivalence as being determined by their own independent factors (four-factor model). Superior fit of the four-factor model will demonstrate that the hypotheses were premised upon a correct understanding of the latent structure of the attitude parameters and meta-psychological ambivalence.
Figure 5.2. One-factor measurement model of the mixed evaluation, intensity and latitude of acceptance parameters and meta-psychological ambivalence.
Figure 5.3. Two-factor measurement model of the mixed evaluation, intensity and latitude of acceptance parameters and meta-psychological (MP) ambivalence.
Figure 5.4. Four-factor measurement model of the mixed evaluation, intensity and latitude of acceptance parameters and meta-psychological (MP) ambivalence.
The structural model to be evaluated is depicted in Figure 5.5 below. This model represents the hypothesised linear relationships, whereby the meta-psychological ambivalence latent variable is predicted by the mixed evaluation, intensity and latitude of acceptance parameters as well as their interactions. The inclusion of interaction terms in a SEM framework has been a problematic issue as they are multiplicative effects of the main variables and thus non-linear (Kenny & Judd, 1984; Schumacker & Lomax, 2004).

Kenny and Judd (1984) introduced a procedure to test these interaction effects by creating a new interaction latent variable whose observed indicators are the cross-products of the main latent variables. In this procedure the full set of cross-products are utilised, but Jöreskog and Yang (1996) and Jaccard and Wan (1996) demonstrated that, for simplicity, only one cross-product between each main latent variable should be utilised. These are typically the indicators that have the highest factor loadings for each latent variable.
Figure 5.5. Structural model with the mixed evaluation (ME), intensity (Int) and latitude of acceptance (LoA) attitude parameters as well as their interactions as predictors of meta-psychological (MP) ambivalence.
5.6.5 Procedure

Participants were tested in a group setting ranging from 2 to 8 individuals in size. At the beginning of the testing session, participants were given a general introduction to the purpose of the study as well as the relevant ethical information. In addition, they were instructed to carefully follow all instructions provided and to ask for clarification from the experimenter if they were unsure about any of the tasks. For each attitude issue, participants were required to respond to a number of tasks that were administered via computer using the Quask Formartist survey software (http://www.quask.com).

The pair-comparison task was always administered first as it required the most concentration. The order of all other tasks was counter-balanced across participants. Additionally, the order of the attitude issues was counter-balanced across participants. Upon completion, the participants were provided with thorough debriefing information.

5.7 Results

5.7.1 Testing the assumptions of Coombs’ unidimensional unfolding model

The pair comparison and item-rating judgements were examined to ensure that they satisfied the conditions of Coombs’ (1964) model in this larger sample. The frequencies of the intransitive judgement, folding and single-path errors for the pair comparison task across the three issues are presented in Table 5.1 below.
Table 5.1

Frequencies of intransitive judgement (Int.), folding (F.) and single-path (SP) errors for each of the statement pairs for the abortion (AN), euthanasia (EU) and Aboriginal Australians (AA) issues.

<table>
<thead>
<tr>
<th>Statement Pairs</th>
<th>AN</th>
<th>EU</th>
<th>AA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Int.</td>
<td>F.</td>
<td>SP</td>
</tr>
<tr>
<td>AB</td>
<td>3</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>AC</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>AD</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AE</td>
<td>2</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>AF</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>BC</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>BD</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>BE</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>BF</td>
<td>8</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>CD</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CE</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>CF</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>DE</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>DF</td>
<td>5</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>EF</td>
<td>1</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>36</td>
<td>33</td>
<td>30</td>
</tr>
</tbody>
</table>
For the abortion issue, 36 (1.2%) judgements were intransitive. Thirty-three (1.1%) judgements were folding errors. Finally, there were 30 (1%) single-path errors. This was an overall error rate of 3.3%.

For the euthanasia issue, 54 (1.8%) judgements were intransitive. Thirteen (0.4%) judgements were in violation of the folding condition. Thirty-nine (1.3%) judgements were in violation of the single-path condition. This was an overall error rate of 3.5%.

For the Aboriginal Australians issue, 37 (1.2%) judgements were intransitive. A total of 36 (1.2%) judgements were in violation of the folding condition. Eighteen (0.6%) judgements were single-path errors. This was an overall error rate of 3%. These total error rates for each of the issues were considered sufficiently small to conclude that the data were consistent with the assumptions of Coombs’ (1964) model.

These findings permitted the construction of the ordered metric solutions, which are presented in Figures 5.6, 5.7 and 5.8 below. These are equivalent to the findings of Study 3 in Chapter 4. However, based on the current findings, only the Aboriginal Australians issue’s path contained arbitrary elements where some preference orders were not provided by any of the respondents. The frequencies of each preference order across the three issues are also presented in the Figures. As the midpoint orderings were identical to Chapter 4, the tests of the double cancellation condition were identical and thus satisfied. This provided evidence that these attitude dimensions possess additive structure.
Figure 5.6. The single-path through the proximity graph for the abortion issue, the frequencies of the preference orders and the ordered-metric solution obtained from the midpoint ordering.
Figure 5.7. The single-path through the proximity graph for the euthanasia issue, the frequencies of the preference orders and the ordered-metric solution obtained from the midpoint ordering.
Figure 5.8. The single-path through the proximity graph for the Aboriginal Australians issue with black arrows marking the dominant path and green arrows marking the arbitrary path, the frequencies of the preference orders and the ordered-metric solution obtained from the midpoint ordering.
Secondly, the item-rating judgements were examined. For the Abortion issue there were 26 (2.2%) unfolding errors and 11 (0.9%) single path errors. For the Euthanasia issue there were 52 (4.3%) unfolding errors and 10 (0.8%) single path errors. For the Aboriginal Australians issue there were 45 (3.75%) unfolding errors and 12 (1%) single path errors. This resulted in total error rates of 3.1%, 5.1% and 4.75% across the three issues. These higher error rates for the rating judgements over the pair comparison judgements for the euthanasia and Aboriginal Australians issues are consistent with previous research (Davies, 2004; Michell, 1998).

Typically, ratings are a less reliable means of collecting preference data, despite their greater convenience. This point is pronounced by the fact that it is not possible to provide an intransitive rating response and this should be considered when comparing the error rates of the two tasks. Nonetheless, the levels of error were considered small enough to conclude that the rating data were also consistent with the assumptions of the unidimensional unfolding model. See Appendix F for the complete rating judgements analyses.

Interestingly, the single-path solutions for the rating judgements were equivalent to those derived from the pair comparison judgements, which are presented in Figures 5.6, 5.7 and 5.8. Thus, the tests of double cancellation and ordered metric solutions were identical. Overall, these findings justified the calculation of the ME CoombsPC and ME CoombsRt measures described in Section 5.6.3, and in turn, their inclusion in the SEM analyses.
5.7.2 Testing the SEM assumptions

Before performing the SEM analyses, the data assumptions of this procedure were investigated. Firstly, a sample size of 200 was obtained which is generally accepted as the minimum sufficient for validly testing models (Kline, 1998). Furthermore, as discussed in the previous section, the scaling solutions for each of the attitude scales were identical to Chapter 4. Importantly, these solutions provided evidence that the latent variables being examined were quantitatively structured, consistent with the interval scaling assumption of SEM. The findings of Appendix E provided evidence that both the intensity parameter and meta-psychological ambivalence are quantitatively structured. Furthermore, as the latitude of acceptance parameter was conceptualised as an interval of the evaluative dimension, the findings of the previous section were taken to be indicative that this parameter is quantitative for the three issues. This is the first example in an attitude measurement context of this SEM assumption being systematically addressed.

The measures were examined for their compliance with the multivariate normality assumption of the maximum likelihood estimation method of SEM by inspecting whether the univariate distributions were normal (Kline, 1998). The results of this analysis across the three issues are presented in Table 5.2. In accordance with Kline (1998), values of the ratio of the skew index and its standard error greater than ±3 and values of the ratio of the kurtosis index and its standard error greater than ±10 were taken to indicate problematic levels of non-normality.
Table 5.2

*Skew and Kurtosis indexes and their critical ratios for each of the measures across the three attitude issues.*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Abortion</th>
<th>Euthanasia</th>
<th>Aboriginal Australians</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME CoombsPC</td>
<td>-1.0</td>
<td>-5.7</td>
<td>0.8</td>
</tr>
<tr>
<td>ME CoombsRt</td>
<td>-0.4</td>
<td>-2.6</td>
<td>0.8</td>
</tr>
<tr>
<td>ME SIM</td>
<td>-0.1</td>
<td>-0.3</td>
<td>-1.3</td>
</tr>
<tr>
<td>Int Sub</td>
<td>-0.4</td>
<td>-2.2</td>
<td>-0.3</td>
</tr>
<tr>
<td>Int SIM</td>
<td>-0.1</td>
<td>-0.3</td>
<td>2.2</td>
</tr>
<tr>
<td>Int Rate</td>
<td>-1.6</td>
<td>-9.4</td>
<td>2.5</td>
</tr>
<tr>
<td>LoA SJ</td>
<td>-0.4</td>
<td>-2.2</td>
<td>0.5</td>
</tr>
<tr>
<td>LoA Rate</td>
<td>-0.6</td>
<td>-3.3</td>
<td>0.3</td>
</tr>
<tr>
<td>LoA Mean Rate</td>
<td>-0.1</td>
<td>-0.5</td>
<td>0.0</td>
</tr>
<tr>
<td>MPA Mixed</td>
<td>0.3</td>
<td>2.0</td>
<td>-1.1</td>
</tr>
<tr>
<td>MPA Conflict</td>
<td>0.5</td>
<td>2.6</td>
<td>-1.0</td>
</tr>
<tr>
<td>MPA Indecision</td>
<td>0.6</td>
<td>3.5</td>
<td>-0.8</td>
</tr>
</tbody>
</table>
For both the abortion and euthanasia issues, the skew ratio of the ME CoombsPC and the Int Rate measures were problematic. For the abortion issue, the skew levels of the LoA Rate and MPA Indecision measures were borderline, but were deemed acceptable due to minimal kurtosis levels.

For the Aboriginal Australians issue, the skew ratio of the ME CoombsRt measure and the kurtosis ratio for the Int SIM measure were problematic. The skew level of the Int Rate measure was borderline, but again was deemed acceptable due to a minimal kurtosis level.

Transformations were performed on these problematic measures in order to correct their non-normality (Kline, 1998). Log-transformations adequately corrected the skew of the ME CoombsPC measure of both the abortion and euthanasia issues, the ME CoombsRt measure of the Aboriginal Australians issue and the Int Rate measure of the euthanasia issue to acceptable levels. This also corrected the Kurtosis of the Int SIM measure of the Aboriginal Australians issue to an acceptable level. However, no transformation was found which adequately corrected the Int Rate measure of the abortion issue and thus this measure was excluded from the SEM analysis for this issue.

5.7.3 Reliability analyses, descriptive statistics and correlations of the measures across the three attitude issues.

Cronbach’s alphas were calculated for the sets of measures for each of the attitude parameters across the three issues. The alphas for the mixed evaluation parameter (.75-.79) and meta-psychological ambivalence parameter (.87-.90) were acceptably high. This was not the case for the alphas for the intensity parameter (.14-.43) and the latitude of acceptance parameter (.41-.54).
Tables 5.3, 5.4 and 5.5 present the means and standard deviations for each of the measures as well as their inter-correlations across the abortion, euthanasia and Aboriginal Australians issues. These patterns of correlations were initially inspected to ascertain whether the measures of the same parameter were significantly, positively correlated as expected and to gain a preliminary understanding of the inter-relationships between the parameters.

As can be seen in these tables, the patterns of correlations are very similar across the three issues and thus the relationships between the measures will be addressed in general. The correlations between the mixed evaluation measures were all satisfactorily high, ranging between .42 and .77. Similarly, the correlations between the meta-psychological ambivalence items were highly significant, ranging between .64 and .79. The latitude of acceptance measures only displayed low to moderate correlations with one another, ranging between .19 and .67, but all relationships were significantly positive. The low and in some cases non-significant correlations between the attitude intensity measures were concerning.

The correlations between the measures of the different parameters were generally low. Only the mixed evaluation and meta-psychological ambivalence consistently demonstrated moderate, significant correlations, ranging between .22 and .68 across the three issues.
Table 5.3

Means and standard deviations of the mixed evaluation, intensity, latitude of acceptance and meta-psychological ambivalence measures and their Pearson Product-Moment correlations for the abortion issue.

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>SD</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) ME CoombsPC</td>
<td>7.34</td>
<td>2.54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) ME CoombsRt</td>
<td>7.21</td>
<td>1.95</td>
<td>.59*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) ME SIM</td>
<td>5.38</td>
<td>3.26</td>
<td>.52*</td>
<td>.45*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Int Sub</td>
<td>6.92</td>
<td>2.32</td>
<td>-.01</td>
<td>.01</td>
<td>-.22*</td>
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*p<.05; **p<.01
Table 5.4

Means and standard deviations of the mixed evaluation, intensity, latitude of acceptance and meta-psychological ambivalence measures and their Pearson Product-Moment correlations for the euthanasia issue

<table>
<thead>
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<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
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<td>.49**</td>
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<td>-.10</td>
<td>-</td>
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<td>-.07</td>
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<td>-.09</td>
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<td>-.05</td>
<td>.70**</td>
<td>.78**</td>
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*p<.05; **p<.01
Table 5.5

*Means and standard deviations of the mixed evaluation, intensity, latitude of acceptance and meta-psychological ambivalence measures and their Pearson Product-Moment correlations for the Aboriginal Australians issue.*

<table>
<thead>
<tr>
<th>Measure</th>
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<th>$SD$</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
<th>(12)</th>
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<tr>
<td>(4) Int Sub</td>
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<td>2.26</td>
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<td>-.30**</td>
<td>-.33**</td>
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<td>-.37**</td>
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<td>(9) LoA mean rate</td>
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<td>.18**</td>
<td>-.03</td>
<td>.08</td>
<td>.20**</td>
<td>.44**</td>
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<td>.46**</td>
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<td>-.16*</td>
<td>.17*</td>
<td>-.28**</td>
<td>.04</td>
<td>.18**</td>
<td>.23**</td>
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<td>.22**</td>
<td>.56**</td>
<td>-.30**</td>
<td>.22**</td>
<td>-.28**</td>
<td>.03</td>
<td>.07</td>
<td>.06</td>
<td>.64**</td>
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<td>2.32</td>
<td>.38**</td>
<td>.32**</td>
<td>.53**</td>
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<td>.17*</td>
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<td>.08</td>
<td>.03</td>
<td>.11</td>
<td>.77**</td>
<td>.69**</td>
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</table>

*p<.05; **p<.01
Overall, the patterns of relationships from the reliability and correlational analyses were consistent with the prediction that the measures of the same attitude parameter would interrelate greater than measures of different parameters. However, this trend was far less so for the intensity and latitude of acceptance parameters and their results question whether the different measures are reliably assessing a unidimensional construct. But, as previously addressed, these commonly used statistics are confounded and potentially attenuated by measurement error and in order to more rigorously investigate these intra and inter-relationships, the data structure was investigated utilising SEM.

5.8 The relationships between the attitude parameters and meta-psychological ambivalence utilising structural equation modelling

As previously discussed in Section 5.5.3, McDonald and Ho (2002) recommend that a two-stage reporting approach should be adopted, whereby the measurement model is first subjected to a confirmatory factor analysis before fitting the structural model. In accordance with this, the measures of the different attitude parameters were subjected to the one-factor, two-factors and four-factors models specified in Section 5.5.4.

The covariance structures were analysed utilising the AMOS Version 7 (Arbuckle, 2006) statistical software utilising the maximum likelihood estimation method. As aforementioned, this method has been found to provide robust estimates even under sub-optimal conditions (Hoyle & Planter, 1995; Kline, 1998). Furthermore, as recommended by McDonald and Ho (2002) the fit statistics utilised were the model chi square ($\chi^2$), the Root mean square error of comparison including
confidence intervals (RMSEA) and the comparative fit index (CFI). The $\chi^2$ statistic indicates acceptable fit when it is not statistically significant. In addition, acceptable fit is typically indicated when the $\chi^2$ value is less than three times the degrees of freedom (Kline, 1998). However, Schumacker and Lomax (2004) argue that ratios up to 5 to 1 indicate acceptable fit. Conventionally, a RMSEA value less than .08 indicates acceptable fit with scores less than .05 indicating good fit (Kline, 1998). Similarly, a CFI value greater than .9 is typically taken to indicate acceptable fit and values greater than .95 indicate good fit.

5.8.1 Parameter estimates and comparative fit of the one, two and four-factor measurement models

The parameter estimates and fit statistics for each of the measurement models across the three issues are presented in Tables 5.6, 5.7 and 5.8. As can be seen, the one-factor model was a poor fit of the data across the three issues. The $\chi^2$/df ratios were 9.23, 6.64 and 8.13 for the abortion, euthanasia and Aboriginal Australians issues respectively. Similarly, the close fit tests for the RMSEA statistic were significant across the three issues, thus indicating that their values could be confidently considered greater than .08.
Table 5.6

The SEM parameter estimates including the Unstandardised (Unst.) regression weights and their standard errors (SE), the Standardised (St.) regression weights and the significance values (p) for the one-factor model across the three issues.

<table>
<thead>
<tr>
<th>Parameter estimate</th>
<th>Abortion</th>
<th></th>
<th>Euthanasia</th>
<th></th>
<th>Aboriginal Australians</th>
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<tr>
<td></td>
<td>Unst.</td>
<td>SE</td>
<td>St. p</td>
<td>Unst.</td>
<td>SE</td>
<td>St. p</td>
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<td>0.04</td>
<td>0.01</td>
<td>0.46 .00</td>
<td>0.06</td>
<td>0.01</td>
<td>0.58 .00</td>
</tr>
<tr>
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<td>0.05</td>
<td>0.45 .00</td>
<td>0.48</td>
<td>0.07</td>
<td>0.47 .00</td>
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<tr>
<td>Amb -&gt; ME SIM</td>
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<td>0.76</td>
<td>0.07</td>
<td>0.67 .00</td>
</tr>
<tr>
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<td>0.07</td>
<td>-0.02 .83</td>
<td>0.00</td>
<td>0.07</td>
<td>0.00 .98</td>
</tr>
<tr>
<td>Amb -&gt; Int SIM</td>
<td>0.14</td>
<td>0.04</td>
<td>0.28 .00</td>
<td>0.09</td>
<td>0.03</td>
<td>0.19 .01</td>
</tr>
<tr>
<td>Amb -&gt; Int Rate</td>
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<td>Na</td>
<td>Na</td>
<td>Na</td>
<td>0.04</td>
<td>0.01</td>
</tr>
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<td>Amb -&gt; LoA SJ</td>
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<td>0.09</td>
<td>0.08</td>
<td>0.27</td>
<td>0.17</td>
<td>0.11</td>
</tr>
<tr>
<td>Amb -&gt; LoA Rate</td>
<td>0.18</td>
<td>0.09</td>
<td>0.15</td>
<td>0.05</td>
<td>-0.18</td>
<td>0.11</td>
</tr>
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<td>0.03</td>
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<td>Na</td>
<td>.88</td>
<td>Na</td>
<td>1</td>
<td>Na</td>
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</tbody>
</table>

Note: For abortion $\chi^2 (44) = 406.11, p < .00; \text{RMSEA} = .20 (.19-.22 \text{ 90% CI}); \text{CFI} = .62$. For euthanasia $\chi^2 (54) = 358.75, p < .00; \text{RMSEA} = .17 (.15-.19 \text{ 90% CI}); \text{CFI} = .64$. For Aboriginal Australians $\chi^2 (54) = 439.19, p < .00; \text{RMSEA} = .19 (.17-.21 \text{ 90% CI}); \text{CFI} = .59$. 

Na = not applicable.
Table 5.7

The SEM parameter estimates including the Unstandardised (Unst.) regression weights and their standard errors (SE), the Standardised (St.) regression weights and the significance values (p) for the two-factor model across the three issues.

| Parameter estimate       | Abortion |         |         |         |         |         |         |         |         |         |         |         |         |         |
|--------------------------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                          | Unst.    | SE      | St.     | p       | Unst.    | SE      | St.     | p       | Unst.    | SE      | St.     | p       | Unst.    | SE      | St.     | p       |
| Amb -> ME CoombsPC       | 1        | Na      | .61     | Na      | 1        | Na      | .83     | Na      | 1        | Na      | .88     | Na      |
| Amb -> ME CoombsRt       | 7.54     | 1.15    | .57     | .00     | 8.79     | 0.83    | .78     | .00     | 0.05     | 0.00    | .77     | .00     |
| Amb -> ME SIM            | 19.44    | 2.32    | .87     | .00     | 8.01     | 0.90    | .65     | .00     | 0.37     | 0.04    | .62     | .00     |
| Amb -> Int Sub           | -1.92    | 1.23    | -.12    | .12     | -1.22    | 0.78    | -.12    | .12     | -0.14    | 0.03    | -.33    | .00     |
| Amb -> Int SIM           | 1.83     | 0.70    | .21     | .01     | 0.92     | 0.39    | .18     | .02     | 0.01     | 0.02    | .03     | .70     |
| Amb -> Int Rate          | Na       | Na      | Na      | Na      | 0.42     | 0.08    | .42     | .00     | -0.07    | 0.02    | -.37    | .00     |
| Amb -> LoA SJ            | 1.60     | 1.61    | .08     | .32     | 2.36     | 1.23    | .15     | .05     | 0.26     | 0.08    | .24     | .00     |
| Amb -> LoA Rate          | 2.86     | 1.74    | .13     | .10     | -3.86    | 1.27    | -.23    | .00     | 0.44     | 0.09    | .36     | .00     |
| Amb -> LoA Mean Rate     | -0.39    | 0.36    | -.09    | .27     | -1.19    | 0.28    | -.33    | .00     | 0.03     | 0.01    | .25     | .00     |
| MP Amb -> MPA Mixed      | 1        | Na      | .85     | Na      | 1        | Na      | .80     | Na      | 1        | Na      | .87     | Na      |
| MP Amb -> MPA Conflict   | 0.99     | 0.07    | .86     | .00     | 1.13     | 0.09    | .86     | .00     | 0.98     | 0.08    | .75     | .00     |
| MP Amb -> MPA Indecision | 1.02     | 0.06    | .90     | .00     | 1.13     | 0.08    | .89     | .00     | 0.98     | 0.07    | .89     | .00     |

Note: For abortion $\chi^2 (43) = 369.05, p < .00$; RMSEA = .20 (.18-.21 90% CI); CFI = .66. For euthanasia $\chi^2 (53) = 263.33, p < .00$; RMSEA = .14 (.12-.16 90% CI); CFI = .75. Na = not applicable. For Aboriginal Australians $\chi^2 (53) = 349.52, p < .00$; RMSEA = .17 (.15-.19 90% CI); CFI = .69.
### Table 5.8

The SEM parameter estimates including the Unstandardised (Unst.) regression weights and their standard errors (SE), the Standardised (St.) regression weights and the significance values (p) for the four-factor model for the abortion and Aboriginal Australians issues.

<table>
<thead>
<tr>
<th>Parameter estimate</th>
<th>Abortion</th>
<th></th>
<th>Aboriginal Australians</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unst.</td>
<td>SE</td>
<td>St.</td>
<td>p</td>
</tr>
<tr>
<td>Amb -&gt; ME CoombsPC</td>
<td>1</td>
<td>Na</td>
<td>.59</td>
<td>Na</td>
</tr>
<tr>
<td>Amb -&gt; ME CoombsRt</td>
<td>7.31</td>
<td>1.19</td>
<td>.52</td>
<td>.00</td>
</tr>
<tr>
<td>Amb -&gt; ME SIM</td>
<td>21.44</td>
<td>2.67</td>
<td>.92</td>
<td>.00</td>
</tr>
<tr>
<td>Int -&gt; Int Sub</td>
<td>1</td>
<td>Na</td>
<td>.39</td>
<td>Na</td>
</tr>
<tr>
<td>Int -&gt; Int SIM</td>
<td>1.17</td>
<td>0.46</td>
<td>.81</td>
<td>.01</td>
</tr>
<tr>
<td>Int -&gt; Int Rate</td>
<td>Na</td>
<td>Na</td>
<td>Na</td>
<td>Na</td>
</tr>
<tr>
<td>LoA -&gt; LoA SJ</td>
<td>1</td>
<td>Na</td>
<td>.36</td>
<td>Na</td>
</tr>
<tr>
<td>LoA -&gt; LoA Rate</td>
<td>Na</td>
<td>Na</td>
<td>Na</td>
<td>Na</td>
</tr>
<tr>
<td>LoA -&gt; LoA Mean Rate</td>
<td>0.34</td>
<td>0.18</td>
<td>.55</td>
<td>.06</td>
</tr>
<tr>
<td>MP Amb -&gt; MPA Mixed</td>
<td>1</td>
<td>Na</td>
<td>.84</td>
<td>Na</td>
</tr>
<tr>
<td>MP Amb -&gt; MPA Conflict</td>
<td>1.01</td>
<td>0.07</td>
<td>.87</td>
<td>.00</td>
</tr>
<tr>
<td>MP Amb -&gt; MPA Indecision</td>
<td>1.04</td>
<td>0.07</td>
<td>.90</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note: For abortion $\chi^2 (38) = 200.88, p < .00; \text{RMSEA} = .15 (.13-.17 90\% CI); \text{CFI} = .81$. For Aboriginal Australians $\chi^2 (48) = 189.33, p < .00; \text{RMSEA} = .12 (.10-.14 90\% CI); \text{CFI} = .85$. Na = not applicable.
The two-factor model also poorly fit the data with \( \chi^2/df \) ratios of 8.58, 4.97 and 6.60. Again, the close fit tests for the RMSEA statistics were all significant. However, a chi-square difference test (\( \Delta \chi^2 \)) demonstrated that the two-factor model was a better fit than the one-factor model across all three issues [abortion \( \Delta \chi^2 (1) = 37.06, p< .001 \); euthanasia \( \Delta \chi^2 (1) = 95.42, p< .001 \); Aboriginal Australians \( \Delta \chi^2 (1) = 89.67, p< .001 \)].

There were a number of problems fitting the four-factor model. The LoA rate measure was excluded from the analysis for the abortion issue as it provided a nonsensical negative error variance. Furthermore, no solution was obtainable for the euthanasia issue and thus it was excluded from the analysis.

The four-factor model for the two remaining issues represented a better fit than the two-factor model [abortion \( \Delta \chi^2 (5) = 37.06, p< .001 \); Aboriginal Australians \( \Delta \chi^2 (5) = 160.19, p< .001 \)]. Despite this, the four-factor model was a poor fit of the model with \( \chi^2/df \) ratios of 5.29 and 3.94 and both of the close fit tests for the RMSEA statistic significant.

Thus, comparatively, the four-factor model represented the best fit of the data, at least for the abortion and Aboriginal Australians issues, but overall did not adequately fit the data. This was particularly the case for the euthanasia issue as no admissible solution was obtained. These troubling results led to the re-specification of the models and parameters addressed. This post-hoc process of re-specifying models to obtain better fit is commonplace in SEM analyses and departs from its confirmatory underpinnings (Hoyle & Planter, 1995; Kline, 1998). Thus, the following analyses are performed under the knowledge that they may be capturing idiosyncratic features of the sample and any conclusions drawn require validation by future investigations.
Rather than haphazardly adding/deleting paths from the model, it was
decided that the intensity and latitude of acceptance parameters would be deleted.
This was because the previous analyses, including the reliability alphas, correlations
and SEM parameters, appeared to indicate that the measures of these variables were
predominantly unrelated and thus most likely not assessing a common,
unidimensional construct.

5.8.2 Post-hoc SEM analysis of the relationship between the mixed evaluation
parameter and meta-psychological ambivalence

Firstly, confirmatory factor analyses were performed to empirically test the
assumption that the mixed evaluation parameter and meta-psychological
ambivalence should be treated as independent constructs. The post-hoc one-factor
and two-factor models are represented in Figures 5.9 and 5.10.

The parameter estimates and fit indices for the competing models across the
three attitude issues are presented in Tables 5.9 and 5.10. As can be seen, the one-
factor model poorly fit the data for all three issues. The $\chi^2$/df ratios were 11.78,
14.15 and 17.03 for the abortion, euthanasia and Aboriginal Australians issues.
Similarly, the close fit tests for the RMSEA statistic were significant across the three
issues.

---

8 As this was particularly the case for the intensity variable, the following analyses
were also attempted including the LoA parameter. Solutions were not permissible for
the abortion and euthanasia issues. The one and two-factor solutions for the
Aboriginal Australians issue fit significantly worse than the analyses presented in
Section 5.8.1 [$\Delta\chi^2 (16) = 233.02, p<.01; \Delta\chi^2 (16) = 27.48, p<.05$].
Figure 5.9. Post-hoc one-factor model of the mixed evaluation and meta-psychological ambivalence measures

Figure 5.10. Post-hoc two-factor model of the mixed evaluation and meta-psychological ambivalence measures
Table 5.9

The SEM parameter estimates including the Unstandardised (Unst.) regression weights and their standard errors (SE), the Standardised (St.) regression weights and the significance values (p) for the post-hoc one-factor model across the three issues.

<table>
<thead>
<tr>
<th></th>
<th>Abortion</th>
<th>Euthanasia</th>
<th>Aboriginal Australians</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unst.</td>
<td>SE</td>
<td>St.</td>
</tr>
<tr>
<td>Amb -&gt; ME CoombsPC</td>
<td>1</td>
<td>Na</td>
<td>.46</td>
</tr>
<tr>
<td>Amb -&gt; ME CoombsRt</td>
<td>7.91</td>
<td>1.63</td>
<td>.45</td>
</tr>
<tr>
<td>Amb -&gt; ME SIM</td>
<td>22.60</td>
<td>3.53</td>
<td>.76</td>
</tr>
<tr>
<td>Amb -&gt; MPA Mixed</td>
<td>24.27</td>
<td>3.63</td>
<td>.86</td>
</tr>
<tr>
<td>Amb -&gt; MPA Conflict</td>
<td>23.06</td>
<td>3.48</td>
<td>.84</td>
</tr>
<tr>
<td>Amb -&gt; MPA Indecision</td>
<td>23.85</td>
<td>3.55</td>
<td>.88</td>
</tr>
</tbody>
</table>

Note: For abortion $\chi^2 (9) = 106.05, p < .00; \text{RMSEA} = .23 (.19-.27 90\% \text{CI})$; $\text{CFI} = .86$. For euthanasia $\chi^2 (9) = 127.34, p < .00; \text{RMSEA} = .26 (.22-.30 90\% \text{CI})$; $\text{CFI} = .81$. Na = not applicable. For Aboriginal Australians $\chi^2 (9) = 153.26, p < .00; \text{RMSEA} = .28 (.25-.32 90\% \text{CI})$; $\text{CFI} = .78$. 


Table 5.10

The SEM parameter estimates including the Unstandardised (Unst.) regression weights and their standard errors (SE), the Standardised (St.) regression weights and the significance values (p) for the post-hoc two-factor model across the three issues.

<table>
<thead>
<tr>
<th></th>
<th>Abortion</th>
<th>Euthanasia</th>
<th>Aboriginal Australians</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unst.</td>
<td>SE</td>
<td>St.</td>
</tr>
<tr>
<td>ME -&gt; ME CoombsPC</td>
<td>1</td>
<td>Na</td>
<td>.61</td>
</tr>
<tr>
<td>ME -&gt; ME CoombsRt</td>
<td>7.40</td>
<td>1.16</td>
<td>.55</td>
</tr>
<tr>
<td>ME -&gt; ME SIM</td>
<td>20.15</td>
<td>2.45</td>
<td>.89</td>
</tr>
<tr>
<td>MP Amb -&gt; MPA Mixed</td>
<td>1</td>
<td>Na</td>
<td>.85</td>
</tr>
<tr>
<td>MP Amb -&gt; MPA Conflict</td>
<td>0.99</td>
<td>0.07</td>
<td>.86</td>
</tr>
<tr>
<td>MP Amb -&gt; MPA Indecision</td>
<td>1.02</td>
<td>0.06</td>
<td>.90</td>
</tr>
</tbody>
</table>

Note: For abortion $\chi^2 (8) = 64.11, p < .00$; RMSEA = .14 (.12-.16 90% CI); CFI = .92. For euthanasia $\chi^2 (8) = 52.66, p < .00$; RMSEA = .17 (.13-.21 90% CI); CFI = .93. Na = not applicable. For Aboriginal Australians $\chi^2 (8) = 80.14, p < .00$; RMSEA = .21 (.17-.26 90% CI); CFI = .89.
Chi-square difference tests indicated that the two-factor model fit the data significantly better over the three issues [for abortion $\Delta \chi^2 (1) = 41.94, \ p < .001$; for euthanasia $\Delta \chi^2 (1) = 74.68, \ p < .001$; for Aboriginal Australians $\Delta \chi^2 (1) = 73.12, \ p < .001$]. However, this model still represented a poor fit of the data with $\chi^2$/df ratios of 8.01, 6.58 and 10.02 and all of the close fit tests for the RMSEA statistic significant. This led to further post-hoc modifications of the two-factor model.

Specifically, from the patterns of covariation across the three issues, it appeared that the ME SIM measure was loading upon both the mixed evaluation and meta-psychological ambivalence latent variables. This seemed sensible as this measure was extracted from the similarity between the independent ratings of positive and negative regard toward the issue. It does not seem unlikely that at least some participants would have identified this methodology as addressing how ‘mixed’ their attitude was, and thus the score is not only assessing the valence of their attitude, but also their reflection upon how ambivalent their attitude was. Thus, the model was modified with an additional path from the meta-psychological ambivalence variable to the ME SIM measure. This is represented in Figure 5.11.
5.8.3 Revised post-hoc two-factor model addressing the relationship between the mixed evaluation attitude parameter and meta-psychological ambivalence

Chi-square difference tests indicated that this revised two-factor model represented a better fit of the data across the three issues [for abortion $\Delta \chi^2 (1) = 40.6, p < .001$; for euthanasia $\Delta \chi^2 (1) = 74.68, p < .001$; for Aboriginal Australians $\Delta \chi^2 (1) = 73.12, p < .001$]. The parameter estimates of this model are presented in Table 5.11.
Table 5.11

The SEM parameter estimates including the Unstandardised (Unst.) regression weights and their standard errors (SE), the Standardised (St.) regression weights and the significance values (p) for the revised post-hoc two-factor model across the three issues.

<table>
<thead>
<tr>
<th></th>
<th>Abortion</th>
<th></th>
<th></th>
<th></th>
<th>Euthanasia</th>
<th></th>
<th></th>
<th></th>
<th>Aboriginal Australians</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unst.</td>
<td>SE</td>
<td>St.</td>
<td>p</td>
<td>Unst.</td>
<td>SE</td>
<td>St.</td>
<td>p</td>
<td>Unst.</td>
<td>SE</td>
</tr>
<tr>
<td>ME -&gt; ME CoombsPC</td>
<td>1</td>
<td>Na</td>
<td>.83</td>
<td>Na</td>
<td>1</td>
<td>Na</td>
<td>.86</td>
<td>Na</td>
<td>1</td>
<td>Na</td>
</tr>
<tr>
<td>ME -&gt; ME CoombsRt</td>
<td>7.04</td>
<td>0.94</td>
<td>.71</td>
<td>.00</td>
<td>8.71</td>
<td>0.98</td>
<td>.79</td>
<td>.00</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>ME -&gt; ME SIM</td>
<td>5.85</td>
<td>1.23</td>
<td>.35</td>
<td>.00</td>
<td>4.25</td>
<td>0.95</td>
<td>.35</td>
<td>.00</td>
<td>0.14</td>
<td>0.04</td>
</tr>
<tr>
<td>MP Amb -&gt; ME SIM</td>
<td>0.69</td>
<td>0.08</td>
<td>.56</td>
<td>.00</td>
<td>0.51</td>
<td>0.09</td>
<td>.43</td>
<td>.00</td>
<td>0.79</td>
<td>0.10</td>
</tr>
<tr>
<td>MP Amb -&gt; MPA Mixed</td>
<td>1</td>
<td>Na</td>
<td>.85</td>
<td>Na</td>
<td>1</td>
<td>Na</td>
<td>.81</td>
<td>Na</td>
<td>1</td>
<td>Na</td>
</tr>
<tr>
<td>MP Amb -&gt; MPA Conflict</td>
<td>0.99</td>
<td>0.07</td>
<td>.86</td>
<td>.00</td>
<td>1.12</td>
<td>0.08</td>
<td>.86</td>
<td>.00</td>
<td>0.98</td>
<td>0.08</td>
</tr>
<tr>
<td>MP Amb -&gt; MPA Indecision</td>
<td>1.02</td>
<td>0.06</td>
<td>.90</td>
<td>.00</td>
<td>1.10</td>
<td>0.08</td>
<td>.88</td>
<td>.00</td>
<td>0.94</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Note: For abortion $\chi^2 (7) = 23.51, \ p < .00; \ RMSEA = .11 (0.06-.16 \ 90\% \ CI); \ CFI = .98$. For euthanasia $\chi^2 (7) = 22.05, \ p < .00; \ RMSEA = .10 (0.06-.15 \ 90\% \ CI); \ CFI = .98$. For Aboriginal Australians $\chi^2 (7) = 20.26, \ p < .05; \ RMSEA = .10 (0.05-.15 \ 90\% \ CI); \ CFI = .98$.
Most importantly, from the fit indices this model appeared to adequately fit the data. Despite the fact that the all of the \( \chi^2 \) fit statistics were significant, the \( \chi^2/df \) ratios were in the acceptable range across the three issues [abortion = 3.36; euthanasia = 3.15; Aboriginal Australians = 2.90]. Additionally, the CFI statistics indicated good fit of the model across the three issues (> .95). The troubling results were for the RMSEA statistics, which were all greater than .08. However, their confidence intervals all fell within the acceptable range. Thus, although future studies would undoubtedly attempt to improve this fit, it appeared reasonable to conclude that the fit was acceptable and that meaningful inspection of the model estimates could take place.

As shown in Table 5.11, the regressions weights between the latent and manifest variables were all significant (when possible to be estimated). Interestingly, the ME SIM measure was significantly predicted by both the mixed evaluation and meta-psychological ambivalence variables, confirming the speculation of Section 5.8.2. As predicted, the correlation between the mixed evaluation and meta-psychological ambivalence variables was found to be statistically significant across all three issues [for abortion \( r = .49, p < .01 \); for euthanasia \( r = .53, p < .01 \); for Aboriginal Australians \( r = .47, p < .001 \)].

Finally, a post-hoc regression analysis was performed to examine the prediction of meta-psychological ambivalence by the attitude parameters and their interactions. As outlined in Section 5.6.4, SEM analysis was intended for this investigation. However, the failure to fit the measurement model with the three independent attitude parameters precluded this. Thus, these results are presented as a very preliminary analysis to explore the utility of future investigations in to the
relationship between the attitude intensity and latitude of acceptance parameters, as
well as their interactions with the evaluation parameter, and meta-psychological
ambivalence.

5.8.4 Exploring the structural relationship between the mixed evaluation, intensity
and latitude of acceptance parameters and meta-psychological ambivalence
utilising a post-hoc hierarchical regression

Single measures from each latent variable were selected for entry in to the
hierarchical regression. The CoombsPC measure was entered for the mixed
evaluation parameter as it has been found in this thesis and in previous studies to be a
very reliable measure of the evaluative dimension (Davies, 2004; Johnson, 1998;
Michell, 1998;). The Int Sub measure was entered for intensity, as it is the most
conventionally used measure of this parameter. Similarly, the LoA SJ measure was
entered for the latitude of acceptance parameter, as it was the closest to the original
methodology of the social-judgment theorists who pioneered this parameter (Sherif
et al., 1965). Given the high correlations between the meta-psychological
ambivalence items, these were compiled into a mean score for this parameter. The
interaction terms were calculated by multiplying the mean-centred predictors. This
mean centring was performed to reduce multicollinearity (NB. final Tolerance values
were all acceptable ranging from .76 to 1).
In the regression, the ME Coombs PC measure was entered as the first step, followed by the Int Sub and LoA SJ and then the interaction terms. The results of the regression for each of the issues are presented in Tables 5.12, 5.13 and 5.14. The overall models were statistically significant for each of the issues [For abortion, $R^2 = .15$, $F(5, 194) = 7.07, p < .01$; For Aboriginal Australians, $R^2 = .24$, $F(5, 194) = 12.51, p < .01$; For euthanasia, $R^2 = .24$, $F(5, 194) = 12.45, p < .01$].

Table 5.12

*Final step in the hierarchical regression analysis of predictors of meta-psychological (MP) ambivalence for the abortion issue.*

<table>
<thead>
<tr>
<th>MP Ambivalence</th>
<th>b</th>
<th>SE</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME CoombsPC</td>
<td>0.37</td>
<td>0.07</td>
<td>.34</td>
<td>.00</td>
</tr>
<tr>
<td>Int Sub</td>
<td>0.03</td>
<td>0.08</td>
<td>.03</td>
<td>.66</td>
</tr>
<tr>
<td>LoA SJ</td>
<td>-0.01</td>
<td>0.06</td>
<td>-.01</td>
<td>.89</td>
</tr>
<tr>
<td>ME x Int</td>
<td>0.07</td>
<td>0.03</td>
<td>.17</td>
<td>.01</td>
</tr>
<tr>
<td>ME x LoA</td>
<td>0.04</td>
<td>0.02</td>
<td>.14</td>
<td>.04</td>
</tr>
</tbody>
</table>

For the abortion issue, the ME CoombsPC measure and both of the attitude parameter interaction terms were significant predictors of MP Ambivalence [$t(194) = 5.04, p < .01$; $t(194) = 2.51, p < .05$; $t(194) = 2.08, p < .05$]. Adding the intensity and LoA parameters to the model did not lead to a significant increase in explained variance, $R^2$ change $= .00$, $p = .93$. In contrast, adding the interaction terms to the regression did lead to a significant increase in variance explained, $R^2$ change $= .04$, $p < .05$. 
Table 5.13

*Final step in the hierarchical regression analysis of predictors of meta-psychological (MP) ambivalence for the euthanasia issue.*

<table>
<thead>
<tr>
<th>MP Ambivalence</th>
<th>b</th>
<th>SE</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME CoombsPC</td>
<td>0.47</td>
<td>0.06</td>
<td>.48</td>
<td>.00</td>
</tr>
<tr>
<td>Int Sub</td>
<td>-0.16</td>
<td>0.07</td>
<td>-.14</td>
<td>.03</td>
</tr>
<tr>
<td>LoA SJ</td>
<td>0.03</td>
<td>0.05</td>
<td>.04</td>
<td>.58</td>
</tr>
<tr>
<td>ME x Int</td>
<td>0.02</td>
<td>0.03</td>
<td>.05</td>
<td>.44</td>
</tr>
<tr>
<td>ME x LoA</td>
<td>0.01</td>
<td>0.02</td>
<td>.04</td>
<td>.51</td>
</tr>
</tbody>
</table>

For the euthanasia issue, the ME CoombsPC and Int Sub measures were significant predictors of MP Ambivalence [$t (194) = 7.31, p< .01; t (194) = -2.18, p< .05$. Adding the intensity and LoA parameters to the model did not lead to a significant increase in explained variance, $R^2$ change = .02, $p = .10$. Similarly, adding the interaction terms to the regression did lead to a significant increase in variance explained, $R^2$ change = .00, $p< .62$. 

Table 5.14

Final step in the hierarchical regression analysis of predictors of meta-psychological (MP) ambivalence for the Aboriginal Australians issue.

<table>
<thead>
<tr>
<th>MP Ambivalence</th>
<th>b</th>
<th>SE</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME CoombsPC</td>
<td>0.16</td>
<td>0.03</td>
<td>.40</td>
<td>.00</td>
</tr>
<tr>
<td>Int Sub</td>
<td>-0.26</td>
<td>0.07</td>
<td>-.26</td>
<td>.00</td>
</tr>
<tr>
<td>LoA SJ</td>
<td>0.01</td>
<td>0.03</td>
<td>.03</td>
<td>.70</td>
</tr>
<tr>
<td>ME x Int</td>
<td>0.03</td>
<td>0.01</td>
<td>.21</td>
<td>.00</td>
</tr>
<tr>
<td>ME x LoA</td>
<td>0.00</td>
<td>0.00</td>
<td>-.08</td>
<td>.29</td>
</tr>
</tbody>
</table>

For the Aboriginal Australians issue, the ME CoombsPC and Int Sub measures and mixed evaluation-intensity interaction interaction term were significant predictors of MP Ambivalence \( t (194) = 6.16, p < .01; t (194) = -3.61, p < .01; t (194) = 2.96, p < .01 \). Adding the intensity and LoA parameters to the model did not lead to a significant increase in explained variance, \( R^2 \) change = .03, \( p = .05 \). In contrast, adding the interaction terms to the regression did lead to a significant increase in variance explained, \( R^2 \) change = .04, \( p < .01 \).

Overall, the mixed evaluation parameter, measured by applying Coombs’ (1964) model to the pair comparison judgements, was the most significant predictor of meta-psychological ambivalence for all issues. This was unsurprising given the hypotheses of the chapter as well as the observed relationship between these two variables in Section 5.8.3. The attitude intensity parameter, measured by a subjective rating, was a significant predictor for the euthanasia and Aboriginal Australians issues. The mixed evaluation-intensity interaction term was a significant predictor
for the abortion and Aboriginal Australians issues. The mixed-evaluation-latitude of acceptance interaction term was significant for the abortion issue.

The mixed results for all parameters except mixed evaluation allude to the measurement issues enlightened by the above SEM analyses. However, it appears from these preliminary results that these parameters, and particularly their interactions, are worth pursuing in future examinations of the relationships between the structural components of an attitude and the experience of ambivalence.

5.9 Discussion

5.9.1 Implications for our understanding of the relationships between the attitude parameters and ambivalence

The results provide little insight into the first set of hypotheses regarding the relationships between the attitude parameters. As no satisfactory solution was achieved for the intensity and latitude of acceptance variables little can be said about their relationship with the evaluation parameter and one another. The patterns of correlations between the measures of these parameters are somewhat consistent with the predictions.

Across the three issues, there was some indication of a significant, inverse relationship between levels of intensity and proximity to the centre of the evaluative dimension. However, despite statistical significance, this relationship was only low to moderate in size and provided preliminary evidence that individuals who indicate that they do not care about the issue do not necessarily locate themselves at the centre of the evaluative dimensions when forced to do so. This is relevant to the
discussion of indifference in Chapter 2, which will be addressed later in this discussion.

Results regarding the relationship between proximity to the centre of the evaluative dimension and the latitude of acceptance parameter were inconsistent, ranging between moderately negative to moderately positive. Overall, the results for the relationship between the intensity and latitude of acceptance parameters did not demonstrate any systematic correlation. However, all of these results should be interpreted with extreme caution given the problems highlighted by the SEM analyses. Obviously the relationship between these parameters requires further investigation before firmer conclusions can be drawn.

Despite overall model misfit, the SEM analyses provided preliminary evidence, consistent with Holbrook and Krosnick (2005), that meta-psychological judgements of ambivalence are independent from the structural parameters of the attitude being judged, and that these parameters are in turn independent, as the four-factor model displayed the best fit. However, given that the hypothesised model did not adequately capture the structure of the data, future studies must achieve model fit before firmer conclusions can be drawn.

The post-hoc SEM analyses provided more reliable insight in to the relationship between the evaluation parameter and meta-psychological ambivalence as independent, but related constructs. However, these results must still be interpreted with caution as post-hoc respecification of the model can lead to low model replicability as a revised model may be capturing idiosyncratic qualities of one’s specific sample (MacCallum, Roznowski & Necowitz, 1992). Hoyle and Panter (1995) suggest that in the case of post-hoc modifications, cross-validation studies should be carried out to test the generalisability of the findings. This study
managed to validate the final model across three different attitude issues and thus displays some promise. However, this was limited to a single sample on a single occasion and thus further validation across different samples must be carried out before it can be conclusively accepted.

Nonetheless, there was a consistent relationship across the three issues between the evaluation variable and the meta-psychological ambivalence variable, with common variance ranging between 20% and 25%. This finding demonstrated that there was a systematic relationship between attitudes at the centre of the evaluative dimension and subjective judgements of ambivalence. This provides additional validation of the conceptualisation of bipolarity, and the place of ambivalence within it, presented in the earlier chapters. Furthermore, the fact that this relationship was only found to be moderate in size is unsurprising, as a number of other factors may influence meta-psychological ambivalence.

These include the influences of preference for cognitive consistency as well as consistency with the attitudes of liked others (Newby-Clark et al., 2002; Priester & Petty, 2001). Additionally, Priester and Petty (2001) highlight that mixed affective responses as well as conflict between cognitive and affective responses influence experiences of meta-psychological ambivalence. This chapter only examined ambivalence in cognitive terms.

Even when considering only evaluative conflict, it may be the case that some individuals’ ambivalence was not captured by the semantic content or structure of the statements, despite the efforts of Chapter 3. This alludes to a potential confound in the statements between ambivalence and specificity, which will be elaborated in Chapter 6. Furthermore, the issue of the semantic content of the statements seems particularly pertinent for the Aboriginal Australians issue, where 75% of the sample
provided only four different preference orders. It appears that the statements drawn from the bottom half of the binary tree expressed a level of unfavourability that was unacceptable to the participants, and thus indications of negative evaluations were limited. Therefore, the predicates of the unfavourable statements will need to be altered to allow for the expression of both positive and negative evaluations. This result should also be interpreted in light of the fact that there is a much stronger social norm to appear to evaluate Aboriginal Australians positively than there is for the other issues.

Also, from the discussion in Section 5.3, it seemed reasonable that the attitude intensity and latitude of acceptance parameters may independently and interactively influence meta-psychological ambivalence. The post-hoc regression analyses provided some preliminary insight into this hypothesis. As expected from the SEM findings, proximity to the centre of the evaluative dimension was found to be significantly predictive of meta-psychological ambivalence across the three issues and accounted for the majority of the variance explained by the models. This provides preliminary validation that the measures developed in Chapter 4 are able to capture ambivalent attitudes and further promotes the unfolding approach.

The findings for the intensity parameter were less consistent, but it was found to be a significant predictor for the euthanasia and Aboriginal Australians issues. This suggested that as the intensity of the attitude increased for these issues, the level of meta-psychological ambivalence decreased. The latitude of acceptance parameter was not found to be a significant predictor for any of the issues. The results for the interaction variables were also inconsistent with the evaluation-intensity interaction significant for the abortion and Aboriginal Australians issues and the evaluation-latitude of acceptance interaction only significant for the abortion issue.
The results for the evaluation-intensity interaction were particularly important as Chapter 2 highlighted the importance of attitude intensity for differentiating between ambivalent and indifferent attitudes. As discussed earlier, the present findings suggested that individuals who indicated indifference toward the issues on the intensity measures did not necessarily locate themselves at the centre of the evaluative dimension. Furthermore, the findings of the interaction analyses indicated that, for the abortion and Aboriginal Australians issues at least, subjective judgements of ambivalence were predicted by centrally located attitudes that were also reasonably intense. However, both of these conclusions are intended quite cautiously, as they are drawn from indicators of the intensity variable that the present analyses indicate may not be reliable or valid. Future research on this issue is crucial, as the distinction between indifference and ambivalence goes to the heart of the validity of the bipolar conceptualisation proposed in Chapter 2.

Additionally, future studies should be mindful of the fact that the intended structural model and the eventual post-hoc regression analyses performed suggested a unidirectional causal relationship between the attitude parameters and meta-psychological ambivalence. However, it seems reasonable to speculate that this relationship might be reciprocal or even in the opposite direction, as argued by Holbrook and Krosnick (2005). Thus, the nature and direction of this causal relationship requires further experimental examination.

Overall, the conclusions from this chapter regarding the hypothesised relationships between the attitude parameters as well as meta-psychological ambivalence are at times quite limited and at others quite preliminary. This for the most part was attributable to the measurement problems of the observed indicators of the variables.
5.9.2 Problems with measurement and scoring

Despite the limiting effect of these measurement problems upon the conclusions that can be drawn, these results should not simply be interpreted as a failure. Rather, they are an endorsement of the procedures that allow researchers to check the measurement assumptions that are routinely and often blindly made in social research. This chapter highlights that such problems go beyond the question of quantitivity, which has been the focus of this thesis, to the question of validity in general. Put simply, do our measures assess what we believe them to, including the issues of whether the variable exists, and if so, whether it is unidimensional and quantitatively structured (Borsboom, 2005).

If the typical operationalist approach was followed in this study, erroneous conclusions could have been drawn. The problem is, in attempting to be more rigorous one runs the risk of being left with more questions than answers, as was the case in this study. However, this should not be seen as an impediment to research, but rather a challenge. Given that we are so often dealing with latent constructs in psychology, our conclusions regarding the inter-relationships between these constructs are contingent upon the validity of our measures. This validity must be established before substantive conclusions can be drawn.

This chapter’s removal of the operational bias from the conceptualisation of ambivalence is a first step toward establishing this validity. This is highlighted by the results for the ME SIM and Int SIM measures, which were drawn from the Similarity-Intensity Model (Thompson et al., 1995). As previously discussed, this is one of the most widely utilised models in ambivalence research. The current findings
suggest that this model may not tap the latent constructs it is hypothesised to, particularly with respect to location on the evaluative dimension. This is a fundamental point as a number of researchers have relied upon this empirical model to draw conceptual conclusions regarding the relationship between the forms of ambivalence. The current study suggests that these conclusions may be confounded, as the method stemming from this model appears to assess both ambivalence as a property of an attitude and a meta-psychological judgement. Therefore, the correlations reported for the relationship between this measure and measures of meta-psychological ambivalence may have been artificially inflated.

With respect to the measurement problems of this study, as explained in the method, the evaluative parameter was rescaled so that ‘middle-scores’ were given the highest value. This restricted the range of values as individuals located toward either extreme were given similar scores, which may have had an attenuating effect upon observed relationships. Furthermore, it perhaps mistakenly assumed that as one moves in either direction away from the centre of the evaluative dimension, the resulting relationship with meta-psychological ambivalence would be equivalent. Cacioppo et al. (1997) suggest that feelings of ambivalence will subside more rapidly as you approach the positive extremity of the evaluative dimension. Thus, future studies may benefit by utilising non-linear modelling procedures, which would not necessitate scoring evaluation in this way. These may include models that only make ordinal assumptions, which will be addressed in Chapter 6.

The measurement issues were particularly pronounced for the intensity and latitude of acceptance parameters. Firstly, the primary indicator of intensity was a subjective rating adapted from the scale presented in Appendix E. This was inconsistent with the discussion regarding assessing ambivalence as a property of an
attitude and as a meta-psychological judgement. The item is not assessing the intensity parameter as such, but rather the individual’s judgement of it. Such a judgement may be directly influenced by the parameter, but may also be determined by extraneous influences. One such influence may be a demand characteristic of the task, whereby a respondent may feel as if they should care about the issue because someone is taking the time to ask for their opinion regarding it, and thus inflate their response.

A similar confound appears to have affected the intensity measure drawn from the rating judgements. The results for this measure demonstrated that participants tended to provide an extreme rating of agreement for at least one of the statements, even if they indicated that they did not particularly care about the issue on the subjective measure. Furthermore, as previously discussed, this agreement was not necessarily for the statements located toward the centre of the evaluative dimension. This is inconsistent with the findings of Davies (2004), who provided evidence that the extremity of the rating of agreement for the statement closest to the person’s ideal point was related to the intensity of their attitude. Future research must address this inconsistent finding, as it is fundamental to be able to assess the intensity parameter without relying upon subjective judgements of it. This examination may be better served by including the scale validated in Appendix E, which was excluded from the current analyses for mostly pragmatic reasons, rather than its rating scale adaptation.

Overall, the patterns of correlation and the results of the SEM analyses indicated that the measures of the intensity and latitude of acceptance parameters were not tapping their respective constructs in a unidimensional way, if at all. The question of how to validly assess these attitude parameters is an important research
question unto itself. This is both with respect to their relationship with ambivalence as well as attitude theory in general, which has for too long focused solely upon the evaluative dimension (Krosnick et al., 1993; Visser et al., 2006). This chapter was somewhat guilty of haphazardly assessing these parameters and thus future research needs to correct this applying the same rigour displayed in earlier chapters.

The low correlations between the measures of common latent variables may also be attributable to this study’s attempt to draw upon quite different methodologies for the indicators. This was done in order to alleviate the systematic error that can be introduced by utilising common methods within and across indicators. Future studies may consider implementing a Multitrait-Multimethod approach to control for such measurement bias whilst allowing common methods (Marsh & Grayson, 1995). This approach would further encourage a more systematic account of the sorts of error that may confound our statistical models, like the one advocated in Chapter 4 for our psychometric models.

5.9.3 Future directions and conclusions

Borsboom (2003) highlights an additional problem in the current study that should be addressed in future research. He argues that between-subjects models, such as the ones utilised in this chapter, do not substantiate valid conclusions at the individual level. This is fundamental, as the conceptualisations of the attitude parameters and meta-psychological are as intra-individual constructs. Without the modelling of within subject data, it will remain unclear whether the relationships between the attitude parameters and meta-psychological ambivalence are a by-product of aggregated data, or whether they genuinely explain relationships at an individual
level. This is a point that also pertains to the tests of quantitative structure presented in the previous chapter, which will be elaborated in Chapter 6.

Additionally, an improved understanding of ambivalence is important for our conceptualisation of the attitude-behaviour relationship. Andrich and Styles (1998) demonstrated utilising an unfolding methodology that attitude and behaviour statements may be scaled on a common dimension, with the behaviour items consistently located at more extreme locations. They argue that the non-significant relationship often found between attitudes and behaviour may be attributable to the behaviour statements utilised. This is obviously relevant to assessing ambivalent individuals who tend to be located toward the centre of the evaluative dimension. Thus, understanding the relationship between their attitudes and behaviour entails the provision of behaviour statements that are more moderate in nature. Furthermore, it may be the case that behaviour is not only predicted by location on this dimension, but also the intensity and latitude of acceptance parameters.

Overall, the findings of this chapter reinforced the distinction between the two forms of ambivalence. However, it did so in a manner that departed from the operationalist conventions. This distinction is framed in terms of ambivalence as a property of an attitude and as a meta-psychological judgement. Conclusions regarding the relationships between these were limited by measurement problems. However, a significant relationship between the evaluation parameter and meta-psychological ambivalence was established. This finding provides further validation of the conceptualisation of the evaluative dimension that has been explored throughout this thesis and its relationship with ambivalence. Furthermore, it provides further validation of the measures developed in Chapter 4 to reflect this conceptualisation.
Other results provided preliminary evidence that the relationships between ambivalence and other attitude parameters are worth investigating. The attitude intensity parameter, in particular, appears relevant to distinguishing between indifference and ambivalence. However, the findings starkly demonstrate that these relationships can only be thoroughly explored if the measures of these parameters are constructed with the same rigour displayed in Chapters 3 and 4.
Chapter 6 – Conclusions and future directions for ambivalence research

6.1 Introduction

This thesis aimed to investigate the implications of ambivalence for the conceptualisation and measurement of attitudes. Firstly, this involved providing evidence that ambivalence is consistent with a bipolar conceptualisation of attitudes, despite the consensus within the mainstream attitude literature that it is not (Cacioppo et al., 1997; Conner & Armitage, 2008; Thompson et al., 1995). Secondly, it involved the construction and validation of attitude scales sensitive to both ambivalent evaluations and the quantitative assumption. Thirdly, these scales were used to investigate the latent structure of attitudes and its relationship with meta-psychological judgements of ambivalence.

The results for the first two sets of analyses validated the predictions that ambivalence is consistent with the unidimensional, bipolar and quantitative conceptualisation of attitudes, albeit in a different form to the general understanding. Additionally, they provided further validation of unfolding measurement models in the attitude context. These models alleviate many of the problems faced by the ubiquitous method of summated ratings, including the assessment of ambivalent evaluations.

The conclusions drawn from the third set of analyses were far more limited. Specifically, the results highlighted the importance of rigorously considering measurement issues for all attitude parameters, which is testament to the attempt to
break away from the operational biases of this literature. Nonetheless, these analyses presented preliminary validation of these scales’ ability to measure ambivalent evaluations, and therefore provide further evidence for this thesis’ novel conceptualisation of the evaluative dimension.

This chapter will critically examine these issues further and make suggestions for future research and clarification. Whilst some aspects of this discussion will undermine earlier work, a major theme throughout all of the chapters has been that attitude researchers should be far more critical of their assumptions. Thus, it is internally consistent that this thesis concludes with such critical reflection. This will include a deeper consideration of the bipolar and quantitative assumptions.

6.2 The conceptualisation of the bipolar evaluative dimension

In Chapter 2, both a conceptual argument and empirical evidence were presented to demonstrate the consistency between the bipolar conceptualisation of attitudes and ambivalent evaluations. Specifically, it was argued that the middle-region of the bipolar evaluative dimension should be conceptualised as the location for ambivalent attitudes. However, this leaves the question of where to locate indifferent attitudes, which are typically located at this middle-point (Andrich et al., 1997).

The suggested solution was that indifferent attitudes do not belong on the evaluative dimension at all, as they are defined by a lack of evaluation. Whilst this conceptual point is hard to argue with, it leaves the practical problem of where indifferent individuals locate their attitudes when forced to do so. Chapter 5 attempted to clarify this issue by investigating the relationship between the evaluative dimension and the attitude intensity parameter. The results were
inconclusive, however, the suggestion was that individuals with low intensity do not necessarily locate themselves at the centre of the evaluative dimension and that the intensity parameter shows promise for distinguishing between ambivalent and indifferent individuals. Clearly, further research is required to draw any firmer conclusions, but it serves as a reminder that attitudes should not simply be thought of as a single point on the evaluative dimension. Other parameters must be considered to fully capture their diversity (Davies, 2004; Krosnick et al., 1993; Visser et al., 2006).

6.2.1 Ambivalence and uncertainty

As part of this, future research must investigate uncertainty as an evaluative state (Andrich et al., 1997; Dubois & Burns, 1975). The issue of uncertainty is quite distinct from the issue of indifference, as it is not concerned with the absence of an evaluation. When a person is uncertain about an attitude issue they may care deeply about it, but their lack of consideration, ignorance, or complexity of the issue leads to an uncertainty. In an unfolding context, this would equate to an unwillingness to commit to any one ideal-point. Their attitude may therefore be better understood as an interval, which encompasses a number of points (Johnson, 2007). This is a crucial issue, as some individuals may interpret ambivalent attitude statements as uncertain in nature. Thus, in this thesis, respondents who were unable or unwilling to commit to an evaluative position may have located themselves at the centre.

In fact, this potential confounding of ambivalence and uncertainty can be identified in the scales constructed in Chapter 3. In the binary tree method, the number of predicates used to construct a statement may be interpreted as affecting
the specificity of it. For example, take the two statements, ‘euthanasia is immoral and should be prohibited in most circumstances’, and, ‘euthanasia is very immoral and should always be prohibited and treated as a criminal offence in most circumstances’. The semantic content of these two statements not only differs in terms of the unfavourability implied by them, but also in terms of their specificity, as the latter is a more specific attitude, i.e., it additionally specifies that euthanasia should be treated as a crime.

If the structure of the binary tree is taken to be reflective of the structure of evaluative judgements, then the specificity of the statements could be taken to indicate how certain the attitudes they reflect are. This is because the addition of predicates may reflect a more extensive consideration of the issue and the more exact specification of an ideal-point. This point alludes to an earlier discussion in Chapter 5, which addressed the latitude of acceptance parameter and whether it should be considered an item or person parameter. It was argued that it should be considered both as the items are intended as analogues of the attitudes and concluded that this should be considered when constructing statements. It appears that this consideration should be done with respect to the specificity of the statements.

For example, the statement, ‘I believe euthanasia is morally acceptable’, is favourable, but not very specific. It could be envisaged as not representing a point on the favourable part of the evaluative dimension, but rather an interval (Johnson, 2007). Therefore, individuals with attitudes at a range of different points may agree with it. The statement, ‘I believe euthanasia is morally acceptable and should always be an option’, represents a more favourable and more specific attitude. By the same reasoning, it may be seen as representing a smaller interval toward the more favourable end of the dimension. Thus, there would be a smaller range of people
with different attitudes who would agree with it. Finally, the statement, ‘I believe euthanasia is morally acceptable, should always be an option, and should even be encouraged’, reflects a very favourable and very specific attitude. Thus, it may represent an even smaller interval toward the extremely favourable end of the dimension. An individual’s attitude would have to be located at a far more specific part of the evaluative dimension for them to agree with it.

In Chapter 3, all of the statements taken from the middle part of the binary tree were less specific than the statements taken from the extremes. Thus, the former were potentially not only reflecting ambivalent evaluations, but also less specific evaluations, which may be interpreted as reflecting uncertainty. Future research is needed to clarify the effect of the specificity of the statements, particularly with respect to ambivalent and uncertain evaluations. Johnson’s (2007) reformulation of Coombs’ (1964) procedure to represent attitudes as intervals, rather than points, provides the opportunity to do this.

Uncertain evaluations may also be elucidated by other attitude parameters. Similar to the latitude of acceptance, the latitude of non-commitment was identified by the social-judgment theorists and was used to describe the area of the evaluative dimension that the individual does not find acceptable or objectionable (Krosnick et al., 1993). It seems reasonable that an uncertain individual will score highly on this parameter as their uncertainty may lead them to neither agree nor disagree with the attitude items. However, this would have to be partnered with some level of attitude intensity to signify that they are not indifferent. Another relevant parameter identified by the attitude strength literature is attitude knowledge. This addresses the amount of knowledge an individual possesses about the issue being evaluated (Visser
et al., 2006). It seems reasonable that uncertainty may correspond with ignorance about the issue.

However, uncertainty may not always emerge from ignorance, as in some cases it may be attributable to the complexity of the issue. For example, I may be uncertain about my attitude toward nuclear power because I am so well informed with respect to arguments from either side that I am unable to differentiate which I prefer. Additionally, uncertainty may stem from a researcher trying to force an attitude into unidimensional space when an individual identifies a number of independent dimensions, e.g., environmental impact of radioactive waste vs. environmental impact of lower carbon dioxide emissions. This individual would not consider themselves ambivalent as their judgements stem from independent dimensions and thus are not conflicting. This highlights how subtle the distinction between ambivalence and uncertainty can be. If an individual does perceive the issue as involving a number of independent dimensions, it may be more appropriate to investigate their evaluation utilising a multidimensional unfolding model, such as Coombs’ (1964) deterministic version or De Soete et al.’s (1986) probabilistic version, in order to uncover these distinct dimensions.

As discussed in Chapter 5, the differentiation between ambivalence and indifference requires further investigation. The current discussion highlights the importance of distinguishing between ambivalence and uncertainty. In both cases, the distinction must consider the structure of the evaluative dimension and a number of other attitude parameters as well as the implications for item construction. This is further complicated by the potential independence of positive and negative evaluations raised in Chapter 2. The results throughout this thesis demonstrate that
ambivalence may not necessitate the abandonment of a bipolar conceptualisation, but there may be other compelling reasons to do so.

6.2.2 A bivariate understanding of the evaluative dimension

Just as the complexity of an issue may necessitate the conceptualisation of evaluative space as multidimensional, a number of researchers have called for a bivariate understanding of the evaluative dimension due to the independence of the positive and negative substrates (Cacioppo et al., 1997; Ito, Larsen, Smith & Cacioppo, 1998; Scott, 1968). Typically, ambivalence is argued to necessitate this, but this thesis has provided evidence that this is not necessarily the case.

Nonetheless, Cacioppo et al. (1997) draw their argument from emerging evidence that positive and negative evaluations are underpinned by independent motivational systems, namely the approach and avoidance systems. The approach system is argued to underpin positive evaluations, whereas the avoidance system underpins negative evaluations. The distinction between these two is supported by an increasing amount of neurological evidence, which indicate distinct brain regions’ associations with each (Cacioppo & Berntson, 1994; Cacioppo et al., 1997; Larsen, Norris & Cacioppo, 2003).

Furthermore, this bivariate understanding provides more flexibility than the bipolar conceptualisation presented in this thesis, as it allows for an uncoupled relationship between positive and negative evaluations. It is empirically possible that an increase or decrease in positivity may not affect levels of negativity, and vice-versa. A bivariate understanding is required to capture such a relationship. In fact, research has provided evidence of this relationship between positive and negative
affective processes (Larsen, McGraw, Mellers & Cacioppo, 2004; Larsen, Norris, McGraw, Hawkley & Cacioppo, in press). However, it remains to be seen whether this is the case for cognitive evaluations.

The discussion in Chapter 2 highlighted that even though positive and negative evaluations may be underpinned by demonstrably independent motivational systems, this does not entail the conclusion that the evaluations themselves are independent. This was explained with reference to the mixer tap analogy in Section 2.7.2. Additionally, Borsboom, Mellenbergh and Van Heerden (2003, p. 215) point out that the investigations of these systems have been dominated by what he terms a “strong uniformity assumption”. That is to say, there is an assumption that the evaluative system is either univariate or bivariate for everyone. However, there is no a priori reason to assume that this structure is equivalent for everyone without extensive within-persons analyses to substantiate such a claim.

Furthermore, there has been no distinction between what he terms “locally homogeneous” and “locally heterogeneous” constructs (Borsboom et al., 2003, p. 215). Locally homogeneous constructs are structurally identical both between and within subjects, whereas locally heterogeneous constructs are not. All investigations of the independence of positive and negative evaluations have relied upon variation between-subjects to substantiate their models. Such data do not entail within-subjects conclusions and thus, not only does it remain to be seen whether this structure is the same for all individuals, but also whether it applies to the individual case at all. Thus, for the moment, there appears to be no compelling reason to accept Cacioppo et al.’s (1997) bivariate understanding over the bipolar conceptualisation. But, this remains an open question. Interestingly, this same criticism of fallaciously drawing within-
subjects conclusions from between-subjects data applies to the quantitative conclusions made in this thesis and others like it.

6.3 Quantitative attitudes as locally homogeneous, locally heterogeneous or locally irrelevant constructs

Chapters 3 and 4 demonstrated a method to construct and validate sets of attitude statements sensitive to both ambivalent evaluations and the ubiquitous assumption of the quantitative structure of attitudes. In doing this, it extended upon the findings of Chapter 2 by reaffirming the location of ambivalent attitudes as proximal to the centre of a demonstrably quantitative dimension. This is a very rare example of this assumption being tested and was essential for the statistical analyses employed in Chapter 5. However, the above discussion highlights how the conclusions drawn from this analysis must be treated with caution.

The conceptualisation of attitudes as within-persons constructs and quantitatively structured is almost universal in attitude research. The former assumption appears self-evident, although they may manifest in between-subjects form as what have been termed ‘group attitudes’ (Jackson et al., 1996). But, as previously discussed, the latter is far from self-evident. Even when it has been tested, there has been a lack of clarity regarding whether this quantitative structure solely exists at the between-subjects level or if it extends to the within-persons level, i.e., whether it is locally heterogeneous or homogeneous in Borsboom et al.’s (2003) terms.

In the case of this thesis and other similar studies, conclusions regarding quantitative structure were drawn from between-subjects data. The quantitative J-
scale was established by fitting each individual’s preference order, or qualitative $L$-scale, to the single-path condition and checking this single-path solution for contradictions via the double-cancellation condition. Thus, all that was demonstrated within the individual was that their attitude was ordinal, i.e., qualitatively structured. This limitation equally applies to tests of quantitivity in the context of probabilistic models (Karabatsos, 2001; Kyngdon & Richards, 2007). In order to make substantiated conclusions regarding the quantitative structure of an individual’s attitude, such analyses must be performed at the individual level. Therefore, whether a quantitative attitude is a locally heterogeneous or homogeneous construct requires further investigation.

This is further complicated by the consideration of locally irrelevant constructs (Borsboom et al., 2003). This term is used to describe a construct that is completely abstracted from the individual and only accounts for between subjects variation. A simple example of this would be ‘sportiness’ with respect to cars. This is not a property or a process of any individual car. Rather, it is a construction used to describe the differences between these properties/processes. If quantitative attitudes are to be shown relevant to the individual case, then variation at the individual level must be observed.

Michell (1973) and Davies (2004) provide some insight into this issue of quantitative structure of attitudes at the individual level. In addition to preference judgements, their research involved participants providing similarity judgements of the statements to test each individual’s perception of the locations of the statements on the dimension. Their results indicated that the ordered metric solutions obtained from the between-subjects preference data and the within-subjects similarity data tended to differ. Whilst these results do not bode well for the quantitative assumption
at the individual level, they do not directly address the issue of attitudinal variation within the individual.

The observation of such variation may require assessing individuals’ attitudes longitudinally, relying upon their natural variation and checking whether this variation is consistent with quantitative assumptions. This means that the changed preference order must be consistent with the single-path condition determined by the between-subjects analysis. Alternatively, individual variation could be observed on a single-occasion by experimentally manipulating the attitude.

There is a long history of literature examining attitude change procedures (McGuire, 1969; Olson & Zanna, 1993; Petty & Cacioppo, 1986; Wood, 2000). These procedures typically involve some variation of presenting an individual with persuasive information or relying upon individuals’ need for social acceptance or both. These methods could be employed to create within-person variation and again the change in the individual preference orders could be checked with respect to the quantitative assumptions. This discussion of differences between attitudes alludes to another issue that brings further doubt to the quantitative conceptualisation of attitudes.

6.3.1 Are attitudes qualitative or quantitative? The difference is in the differences.

From the analyses presented in Chapter 4, it seemed reasonable to conclude that even at the individual level, the attitudes examined were ordinally structured. As previously discussed, ordinal structure is necessary, but not sufficient for quantitivity, as the latter also possesses additivity (Michell, 1990). As part of this, Michell (2006) points out that if the evaluative dimension or the other attitude
parameters are genuinely quantitative, then the differences between the degrees of these variables must be homogeneous. For example, differences between degrees of length are all lengths, although the differences need not be homogeneous with the degrees themselves. This observation helps drag this issue from the abstract realm, of which it must seem to attitude researchers given their lack of education of rigorous measurement theory, to one of substantive significance.

The implication of this is that the determinant of the differences between attitudes at both an individual and aggregated level must be homogeneous if they are in fact quantitative constructs. Thus, that which constitutes the difference between an extremely positive attitude and a moderately positive attitude must be of the same kind as that which constitutes the difference between a moderately positive attitude and an ambivalent attitude. This leaves the attitude researcher thinking in such vague terms as the subtraction of ‘favourability’ when attempting to understand the difference between an individual who possesses an attitude that is mildly racially prejudiced and an individual who is a member of the Ku Klux Klan.

The attitude change literature referred to earlier demonstrates the diversity of influences that may bring about differences in attitudes. Specifically, one method that is successful for one individual may not be successful for another, and similarly, that which successfully changes an individual’s attitude toward one issue, may not be successful for a different issue (Wood, 2000). It may be the case that the effect of these diverse influences on attitude change is mediated by some unidimensional, quantitative construct such as ‘favourability’. However, it also seems a reasonable conjecture that these influences themselves constitute the differences. In this case, the differences between attitudes both within and between individuals are heterogeneous. Clearly, any firmer conclusion must be supported by more rigorous
theory and future research into the determinant(s) of these differences (Michell, 2008b).

The problem is, thinking in purely quantitative terms, as attitude researchers tend to do, precludes this research. It may be the case that these differences are homogeneous, but such a conclusion can only be drawn if attitude researchers are open to the acknowledgement that it may be heterogeneous. Without this acknowledgement, researchers are potentially ignoring some rich detail of attitudes under the guise of ‘measurement’. If these differences are found to be heterogeneous, then the conclusion must be that the attitude is at most ordinally structured.

As Michell (2004b) argues, ordinal structure should not be seen as the poorer cousin of quantitative structure. Ordinal and partially ordered structures are just as amenable to rigorous, mathematical analyses. This has been demonstrated in the fields of linguistics and logic. Ultimately, attitude scientists should be solely concerned with the correspondence between their models and reality. The choice between qualitative or quantitative methodology should be determined by the nature of the subject-matter and not tied to any particular philosophical viewpoint (Michell, 2004b). If attitudes are in fact qualitative constructs, as the above discussion conjectures, then they should be investigated accordingly. Clearly, this issue requires further investigation, as it goes to the heart of our substantive understanding of attitudes.

A crucial implication of the above discussion is when psychometric models and statistical analyses that make quantitative assumptions are utilised, such as those used throughout this thesis and particularly in Chapter 5, the researcher can easily draw conclusions which are determined by the methodology, rather than by the construct (Michell, 2009). This is obviously at odds with rigorous scientific inquiry
and is an issue that has periodically risen in the psychometric and psychological statistics literature.

6.4 Asking ordinal questions does not require quantitative methods

Chapter 5 attempted to rigorously investigate the relationship between ambivalence as a property of an attitude and as a meta-psychological judgement. It utilised structural equation modelling to do this as this method attempts to reveal the relationships between latent variables rather than observed measures. As previously discussed, a key assumption of this statistic methodology is that the observed measures and latent variables are quantitatively structured. This assumption seemed reasonable based upon the results of Chapter 4 and Appendix E.

However, given the current discussion, it may be the case that statistical analyses that only make ordinal assumptions are more warranted. In psychology, the development of ordinal, or non-parametric statistics has lagged well behind their quantitative counterparts despite a brief period of popularity during the middle of the 20th century (Cliff, 1996; Cliff & Keats, 2003). Even in the case of SEM where the issue of ordinal structure has been considered, the pernicious effect of Pythagoreanism continues. The assumption is that even though our crude indicators of a variable may be ordinal, the variable itself is quantitative. In the case of attitudes, this assumption is highly questionable.

Also, this debate has hinged around a more pragmatic point that parametric and non-parametric statistics tend to provide very similar conclusions, whether the data are demonstrably non-quantitative or not (Baker, Hardyck & Petrinovich, 1966; Borgatta & Bohrnstedt, 1980; Stevens, 1951). Michell (1986) makes the point that
prescriptions regarding statistical analyses are not helpful, and the more fundamental
point is that in applying a certain analysis the researcher makes an assumption
regarding the structure of the variable. The pervasive use of parametric statistics adds
an additional layer to the Pythagorean bias of psychology and ultimately
psychologists must be more mindful of the assumptions they are making. The
assumption of quantitivity is routinely mentioned, but rarely tested or even
questioned.

This poses the question of whether the conclusions of this thesis regarding the
implications of ambivalence would be any different if the attitude parameters
addressed are only ordinally structured.

6.4.1 The bipolar conceptualisation of attitudes and the relationship between the
ambivalences: An ordered approach

Cliff (1996) points out that despite the ubiquitous assumption of quantitative
psychological constructs, most of the empirical questions posed by psychologists are
ordinal in nature. The first general aim of this thesis was to investigate the bipolar
evaluative dimension to test whether ambivalence was at odds with it. It was
conceptualised that ambivalence is consistent with such a dimension and quantitative
language was introduced by the prediction that ambivalent evaluations would be
located at the centre of the dimension. This notion of centrality implies a distance
between the poles of which there is a central point and this necessitates quantity.

However, even when the quantitative assumption is removed, the general aim
is still met. Specifically, the Coombs (1964) unfolding analyses in Chapter 4
provided evidence that ambivalent evaluations fit in to a strictly ordered dimension,
whereby negative evaluations display less favourability than ambivalent evaluations, which in turn display less favourability than positive evaluations, i.e., negative < ambivalent < positive. Note how this ordinal understanding reinforces the notion that indifferent attitudes, which are defined by the absence of an evaluation, cannot be accommodated by a unidimensional conceptualisation. It would not make sense to state that negative evaluations display less favourability than indifferent evaluations, as these evaluations are neither favourable nor unfavourable.

The second general aim was to rigorously design attitude scales and utilise these scales to provide evidence that these evaluative dimensions were quantitatively structured. Given the number of statements in each scale, this was solely contingent upon satisfying the double cancellation condition. As aforementioned, the double cancellation condition is just one of an entire hierarchy of cancellation conditions of which only triple cancellation has been further elucidated (Kyngdon & Richards, 2007). It remains to be seen how rigorous the double cancellation condition is as a test of additivity. Thus, it may be more likely that the results of Chapter 4 provided evidence that the evaluative dimension was strictly ordered. This in itself is a rare achievement in psychology as evidenced by the ubiquity of probabilistic item-response models, which were for the most part initiated by individuals consistently violating ordinal assumptions in their response patterns (Michell, 2004a).

The third general aim was to utilise these scales to investigate the relationship between ambivalence as a property of an attitude and as a meta-psychological judgement. Upon closer inspection, the hypotheses of Chapter 5 were ordinal in nature. Specifically, it predicted that particular levels of one attitude parameter would correspond to greater or lesser levels of some other parameter. Furthermore, it predicted that particular levels of each parameter would lead to greater or lesser
levels of meta-psychological ambivalence. Given that the questions were ordinal, there was no reason to invoke quantitative methods. This point was eloquently expressed by Boring (1920, as cited in Michell, 2008c, p. 15) who said, “It is senseless to seek in the logical process of mathematical elaboration a psychologically significant precision that was not present in the psychological setting of the problem”.

However, as alluded to earlier, ordinal methods for analysing psychological data have lagged behind quantitative methods, particularly in the multivariate context. A major premise of Chapter 5 was to attempt to investigate the relationships between the latent variables rather than their indicators in order to escape the operationalist bias present in the ambivalence literature. To date, no equivalent of structural equation modelling that only makes ordinal assumptions with respect to both manifest and latent variables has been developed (Jöreskog, 1990; Rizopoulos & Moustaki, 2008; Shi & Lee, 1998). This is perhaps unsurprising given Michell’s (2009) observation that there is a very long history in psychology of fallaciously concluding that a variable is quantitative when only presented with ordinal evidence. Given its systemic nature in psychometrics, he terms this “the psychometricians’ fallacy” (p. 41).

Consequently, it is unknown whether the same conclusions would be drawn from Chapter 5 if the variables were treated as purely ordinal. However, the size of the linear relationship found between the evaluative dimension and meta-psychological ambivalence utilising SEM suggests that a systematic ordinal relationship would be found. Future research must seriously address whether it is

9 Note that the problematic nature of the causal assumption inherent in this statement was addressed in the discussion of Chapter 5 and further research was recommended to substantiate it.
necessary to treat these attitude parameters quantitatively, and if not, investigate these relationships utilising ordinal psychometric and statistical methods.

6.5 Conclusion

This thesis reinforces a major theme in the attitude literature over the past decade that ambivalence has been ignored for too long. It points out that this was not always the case and the widespread adoption of Likert’s (1932) methodology was a major contributor to this ignorance. Even upon re-emerging as an issue in the attitude literature, the adapted methodology led researchers to conclude that ambivalence was inconsistent with the traditional, bipolar conceptualisation of attitudes. This thesis, by its use of unfolding methodology, provided evidence that this is an incorrect assumption and showed that ambivalent evaluations may be measured in the true sense. Furthermore, conceptualising attitudes in unfolding terms helped to distinguish the operative understanding of ambivalence that is prevalent in the literature. This was reframed in terms of the actual parameters of an attitude and as a meta-psychological judgement. Although the findings for the relationships between these parameters and ambivalence were inconclusive, this understanding provides promise for more rigorous research in to this issue in the future.

In conclusion, an attempt has been made to investigate ambivalent attitudes being mindful of the numerous psychometric assumptions being made. The use of unfolding theory has been integral to this process. Despite the shortcomings addressed in this concluding chapter, such a consideration has helped illuminate the richness and complexity of the attitude concept, which ambivalence is testament to.
Thus, it stands as an encouragement to all attitude researchers to embrace the challenge of measurement, rather than operationalising it away.
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Appendix A: Example screenshots and instructions for each task

A.1 Tasks from Chapter 2

The following figures provide illustrative examples of the electronic presentation of each task and the instructions utilised in the bipolar conceptualisation study of Chapter 2. The demographic questionnaire presented in Figure A1 was utilised in all studies presented throughout the thesis.
Figure A.1. Screenshot of demographic questionnaire utilised in all studies throughout the thesis.
Figure A.2. Screenshot of item rating task for the positive subscale of the BEAMs.

The presentation of the negative and ambivalent subscales of the BEAMs was equivalent, with the exception of the items and where the word ‘positive’ appears in the instructions.
A.2 Tasks from Chapter 3

The following figure provides an illustrative example of the electronic presentation of the task and the instructions utilised in the issues selection study of Chapter 3.

![Abortion issue](image)

**Figure A.3.** Screenshot of task presented in Chapter 3 to select the issues participants consistently felt ambivalent toward.

This task was equivalent for the other issues investigated.
A.3 Tasks from Chapter 4

The following figures provide illustrative examples of the electronic presentation of each task and the instructions utilised in the statement validating studies of Chapter 4.

Figure A.4. Screenshot of the ordering pair comparison task utilised in Study 1 in Chapter 4.
Figure A.5. Screenshot of the ordering rating task utilised in Study 1 in Chapter 4.
Figure A.6. Screenshot of the pair comparison preference task utilised in Studies 2 and 3 in Chapter 4.

The presentation of the pair comparison task in Studies 2 and 3 in Chapter 4 was equivalent in Chapter 5.
A.4 Tasks from Chapter 5

In addition to the pair comparison task presented in the previous section, the following figures provide illustrative examples of the electronic presentation of each task and the instructions utilised in Chapter 5.

Figure A.7. Screenshot of the rating preference task utilised in Chapter 5.
Positive thoughts and feelings Questionnaire

In these tasks you will be asked to rate the extent of your positive thoughts and feelings toward the MORALITY OF EUTHANASIA. Whilst considering your positive thoughts and feelings you should ignore your negative thoughts and feelings.

Whilst ignoring any negative thoughts or feelings you may have, please rate the extent to which you have POSITIVE thoughts and feelings about the morality of euthanasia.

The bivariate negative rating task was identical, but with the word ‘negative’ interchanged for ‘positive’.

Figure A.8. Screenshot of the bivariate positive rating task utilised in Chapter 5.
Figure A.9. Screenshot of the attitude intensity subjective rating task utilised in Chapter 5.
Conflict Question

In the following task you will be asked to rate to what extent your attitude toward the MORALITY OF EUTHANASIA is conflicted.

With respect to my attitude toward the Morality of Euthanasia I ...

Feel No Conflict At All

Feel Maximum Conflict

Figure A.10 Screenshot of the ‘conflict’ meta-psychological ambivalence rating task utilised in Chapter 5.
Figure A.11. Screenshot of the latitude of acceptance task utilised in Chapter 5.
Appendix B: Complete correlational and factor analyses of
Chapter 2

Table B.1

Inter-correlations between positive (1-8) and negative (9-16) subscale items of the
BEAMs for the abortion issue

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Table B.2

Inter-correlations between positive (1-8) and negative (9-16) subscale items of the BEAMs for the Aboriginal Australians issue.

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Table B.3

*Inter-correlations between positive (1-8) and negative (9-16) subscale items of the BEAMs for the homosexuality issue.*

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</tr>
<tr>
<td>6. rewarding</td>
<td>0.56</td>
<td>0.58</td>
<td>0.56</td>
<td>0.46</td>
<td>0.52</td>
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</tr>
<tr>
<td>7. delighted</td>
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<td>0.58</td>
<td>0.49</td>
<td>0.44</td>
<td>0.49</td>
<td>0.57</td>
</tr>
<tr>
<td>8. comfortable</td>
<td>0.29</td>
<td>0.53</td>
<td>0.45</td>
<td>0.46</td>
<td>0.45</td>
<td>0.46</td>
</tr>
<tr>
<td>9. undesirable</td>
<td>-0.30</td>
<td>-0.23</td>
<td>-0.24</td>
<td>-0.31</td>
<td>-0.35</td>
<td>-0.29</td>
</tr>
<tr>
<td>10. negative</td>
<td>-0.37</td>
<td>-0.37</td>
<td>-0.46</td>
<td>-0.42</td>
<td>-0.47</td>
<td>-0.33</td>
</tr>
<tr>
<td>11. unlikable</td>
<td>-0.26</td>
<td>-0.31</td>
<td>-0.33</td>
<td>-0.40</td>
<td>-0.47</td>
<td>-0.28</td>
</tr>
<tr>
<td>12. unhappy</td>
<td>-0.01</td>
<td>-0.11</td>
<td>-0.07</td>
<td>-0.11</td>
<td>-0.23</td>
<td>-0.15</td>
</tr>
<tr>
<td>13. opposing</td>
<td>-0.18</td>
<td>-0.13</td>
<td>-0.15</td>
<td>-0.27</td>
<td>-0.36</td>
<td>-0.10</td>
</tr>
<tr>
<td>14. bad</td>
<td>-0.28</td>
<td>-0.16</td>
<td>-0.33</td>
<td>-0.32</td>
<td>-0.38</td>
<td>-0.20</td>
</tr>
<tr>
<td>15. unattractive</td>
<td>-0.12</td>
<td>-0.20</td>
<td>-0.15</td>
<td>-0.27</td>
<td>-0.30</td>
<td>-0.14</td>
</tr>
<tr>
<td>16. unsatisfying</td>
<td>-0.16</td>
<td>-0.10</td>
<td>-0.25</td>
<td>-0.28</td>
<td>-0.21</td>
<td>-0.11</td>
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</table>

<table>
<thead>
<tr>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>8.</td>
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</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>10.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>11.</td>
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<td></td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>13.</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 13. opposing | 1   |
| 14. bad      | 0.60 | 1   |
| 15. unattractive | 0.47 | 0.56 | 1   |
| 16. unsatisfying | 0.47 | 0.65 | 0.44 | 1   |
Table B.4

*Varimax factor loadings of the 22 BEAMs items for the abortion issue.*

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>favorable</td>
<td>-0.52</td>
<td>0.59</td>
<td>0.03</td>
</tr>
<tr>
<td>appealing</td>
<td>-0.30</td>
<td>0.73</td>
<td>-0.08</td>
</tr>
<tr>
<td>pleasant</td>
<td>0.12</td>
<td>0.56</td>
<td>-0.10</td>
</tr>
<tr>
<td>agreeable</td>
<td>-0.47</td>
<td>0.50</td>
<td>0.06</td>
</tr>
<tr>
<td>approving</td>
<td>-0.54</td>
<td>0.62</td>
<td>-0.01</td>
</tr>
<tr>
<td>rewarding</td>
<td>-0.21</td>
<td>0.72</td>
<td>-0.10</td>
</tr>
<tr>
<td>delighted</td>
<td>-0.04</td>
<td>0.71</td>
<td>-0.10</td>
</tr>
<tr>
<td>comfortable</td>
<td>-0.29</td>
<td>0.47</td>
<td>-0.09</td>
</tr>
<tr>
<td>undesirable</td>
<td>0.62</td>
<td>-0.37</td>
<td>0.29</td>
</tr>
<tr>
<td>negative</td>
<td>0.83</td>
<td>-0.23</td>
<td>0.06</td>
</tr>
<tr>
<td>unlikable</td>
<td>0.85</td>
<td>-0.25</td>
<td>0.13</td>
</tr>
<tr>
<td>unhappy</td>
<td>0.62</td>
<td>-0.28</td>
<td>0.34</td>
</tr>
<tr>
<td>opposing</td>
<td>0.81</td>
<td>-0.05</td>
<td>0.28</td>
</tr>
<tr>
<td>bad</td>
<td>0.86</td>
<td>-0.15</td>
<td>0.16</td>
</tr>
<tr>
<td>unattractive</td>
<td>0.67</td>
<td>0.01</td>
<td>0.29</td>
</tr>
<tr>
<td>unsatisfying</td>
<td>0.57</td>
<td>-0.13</td>
<td>0.39</td>
</tr>
<tr>
<td>muddled</td>
<td>0.02</td>
<td>-0.01</td>
<td>0.84</td>
</tr>
<tr>
<td>jumbled</td>
<td>0.15</td>
<td>0.09</td>
<td>0.82</td>
</tr>
<tr>
<td>tense</td>
<td>0.28</td>
<td>-0.19</td>
<td>0.66</td>
</tr>
<tr>
<td>conflicted</td>
<td>0.10</td>
<td>-0.25</td>
<td>0.78</td>
</tr>
<tr>
<td>divided</td>
<td>0.19</td>
<td>-0.03</td>
<td>0.77</td>
</tr>
<tr>
<td>contradictory</td>
<td>0.26</td>
<td>-0.12</td>
<td>0.68</td>
</tr>
</tbody>
</table>
Table B.5

*Varimax factor loadings of the 22 BEAMs items for the Aboriginal Australians issue.*

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>favorable</td>
<td>-0.24</td>
<td>0.72</td>
<td>0.22</td>
</tr>
<tr>
<td>appealing</td>
<td>-0.09</td>
<td>0.77</td>
<td>-0.09</td>
</tr>
<tr>
<td>pleasant</td>
<td>-0.24</td>
<td>0.76</td>
<td>0.03</td>
</tr>
<tr>
<td>agreeable</td>
<td>-0.32</td>
<td>0.70</td>
<td>-0.01</td>
</tr>
<tr>
<td>approving</td>
<td>-0.35</td>
<td>0.71</td>
<td>-0.01</td>
</tr>
<tr>
<td>rewarding</td>
<td>-0.11</td>
<td>0.77</td>
<td>0.00</td>
</tr>
<tr>
<td>delighted</td>
<td>0.14</td>
<td>0.80</td>
<td>-0.13</td>
</tr>
<tr>
<td>comfortable</td>
<td>0.06</td>
<td>0.70</td>
<td>-0.31</td>
</tr>
<tr>
<td>undesirable</td>
<td>0.70</td>
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<td>0.32</td>
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<tr>
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<td>unlikable</td>
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<td>-0.26</td>
<td>0.09</td>
</tr>
<tr>
<td>unhappy</td>
<td>0.30</td>
<td>-0.12</td>
<td>0.65</td>
</tr>
<tr>
<td>opposing</td>
<td>0.68</td>
<td>-0.08</td>
<td>0.34</td>
</tr>
<tr>
<td>bad</td>
<td>0.83</td>
<td>-0.15</td>
<td>0.10</td>
</tr>
<tr>
<td>unattractive</td>
<td>0.70</td>
<td>-0.09</td>
<td>0.16</td>
</tr>
<tr>
<td>unsatisfying</td>
<td>0.64</td>
<td>-0.07</td>
<td>0.33</td>
</tr>
<tr>
<td>muddled</td>
<td>0.44</td>
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</tr>
<tr>
<td>jumbled</td>
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<td>0.02</td>
<td>0.51</td>
</tr>
<tr>
<td>tense</td>
<td>0.23</td>
<td>0.08</td>
<td>0.69</td>
</tr>
<tr>
<td>conflicted</td>
<td>0.16</td>
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Table B.6

Varimax factor loadings of the 22 BEAMs items for the homosexuality issue.

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>favorable</td>
<td>-0.26</td>
<td>0.70</td>
<td>0.04</td>
</tr>
<tr>
<td>appealing</td>
<td>-0.10</td>
<td>0.76</td>
<td>-0.01</td>
</tr>
<tr>
<td>pleasant</td>
<td>-0.15</td>
<td>0.85</td>
<td>-0.03</td>
</tr>
<tr>
<td>agreeable</td>
<td>-0.28</td>
<td>0.70</td>
<td>-0.10</td>
</tr>
<tr>
<td>approving</td>
<td>-0.44</td>
<td>0.53</td>
<td>-0.20</td>
</tr>
<tr>
<td>rewarding</td>
<td>-0.18</td>
<td>0.82</td>
<td>-0.12</td>
</tr>
<tr>
<td>delighted</td>
<td>0.08</td>
<td>0.80</td>
<td>0.08</td>
</tr>
<tr>
<td>comfortable</td>
<td>-0.36</td>
<td>0.64</td>
<td>-0.02</td>
</tr>
<tr>
<td>undesirable</td>
<td>0.73</td>
<td>-0.30</td>
<td>0.26</td>
</tr>
<tr>
<td>negative</td>
<td>0.83</td>
<td>-0.21</td>
<td>0.18</td>
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<tr>
<td>unlikable</td>
<td>0.75</td>
<td>-0.26</td>
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<tr>
<td>unhappy</td>
<td>0.72</td>
<td>-0.13</td>
<td>0.36</td>
</tr>
<tr>
<td>opposing</td>
<td>0.76</td>
<td>-0.12</td>
<td>0.30</td>
</tr>
<tr>
<td>bad</td>
<td>0.85</td>
<td>-0.15</td>
<td>0.19</td>
</tr>
<tr>
<td>unattractive</td>
<td>0.65</td>
<td>-0.33</td>
<td>0.21</td>
</tr>
<tr>
<td>unsatisfying</td>
<td>0.60</td>
<td>-0.16</td>
<td>0.24</td>
</tr>
<tr>
<td>muddled</td>
<td>0.08</td>
<td>-0.22</td>
<td>0.82</td>
</tr>
<tr>
<td>jumbled</td>
<td>0.14</td>
<td>-0.24</td>
<td>0.82</td>
</tr>
<tr>
<td>tense</td>
<td>0.39</td>
<td>0.17</td>
<td>0.66</td>
</tr>
<tr>
<td>conflicted</td>
<td>0.33</td>
<td>0.13</td>
<td>0.73</td>
</tr>
<tr>
<td>divided</td>
<td>0.29</td>
<td>0.07</td>
<td>0.57</td>
</tr>
<tr>
<td>contradictory</td>
<td>0.33</td>
<td>-0.02</td>
<td>0.61</td>
</tr>
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</table>
Appendix C: Conflicting evaluations of the issue selection

study of Chapter 3

C.1 Conflicting evaluations for the abortion issue

<table>
<thead>
<tr>
<th>What is best for the child ... free choice versus responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that no body should be denied the right to live but at the same time feel for teenagers who have been raped and fall pregnant as I also feel sorry for teenage parents, as most of the time this is not the best situation for a child to be brought up in.</td>
</tr>
</tbody>
</table>

| I feel that a woman should be able to decide whether she wants a child or not, and that it would be very cruel for a child to be born into a family that doesn't want it, but don't see killing a baby as a good thing, when there are options of adoption and alike. |

<table>
<thead>
<tr>
<th>'Speak for those with no voice' etc vs. babies born into environments unfit for their growth and basic rights</th>
</tr>
</thead>
<tbody>
<tr>
<td>My belief that you should have a freedom to choose conflicts with the obvious ethical dilemmas of abortion</td>
</tr>
</tbody>
</table>

| My belief in the baby's right and the value of life conflicts with my sympathy for the mother in terms of her preparedness for the baby and the problem with bringing an unwanted child into the world, for the mother and baby's sake. |

<table>
<thead>
<tr>
<th>My belief that one should not bring a child into the world under circumstances</th>
</tr>
</thead>
<tbody>
<tr>
<td>My feelings relating to free will and bodily autonomy conflict with my feelings relating to morality</td>
</tr>
</tbody>
</table>

| I am very adamant on this issue, the choice to have an abortion is one that should not be taken away, as a young woman I especially sympathise with this, also I believe that ultimately it is the woman’s choice, her body and her life...there is a small part of me that feels much sadness on the issue, but that is quickly overridden with the possibility that I may have to in some way make that choice, and I want to know that I have every possibility presented. |

| I believe it should be for those who cannot support a family, not because they don’t feel like having a baby. |

<table>
<thead>
<tr>
<th>This conflicts with my Christian (Catholic) beliefs</th>
</tr>
</thead>
<tbody>
<tr>
<td>My belief in abortion conflicts with concerns that this procedure is used flippantly and as a casual form of contraception rather than a last resort</td>
</tr>
</tbody>
</table>

| My belief people need to be careful, but in situations of rape I can understand the reasons to do it. |

| I believe that women should have the right to make decisions about their bodies but at the same time I wonder whether abortion is taking a human life. |

| I don't like abortion but I understand that sometimes people find themselves in less than |
desirable situations. It is a personal choice up to each person to make. I can see both sides of the argument.

I don't believe in abortion, however, in some cases such as rape, or knowing that your child will have a disability, abortion should be considered.

It's a woman's choice. Not a male's. If the woman does not feel she will deal with having a child, then it's best she don't, because its not worth the baby's trauma of growing up with a mother that can't handle being a mother.

I believe that women have the right to decide if they wish to keep a baby or not especially if they feel they cannot give the baby a good home. Some pregnancies may be a result of rape so giving birth to the rapists child would not allow the women to fully get over her ordeal if every time she looks at the child she remembers what happened. Women should be able to make this decision, as she will be the carer for the rest of her life.

<table>
<thead>
<tr>
<th>Pos: Abortion is one's own right, in cases such as rape, where a child could be disabled, or where the parents would be unable to properly support the child, abortion seems an acceptable practice. Neg: The Bible does suggest that abortion is unacceptable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that every woman should be given the choice to abort if absolutely necessary but I feel that it should only be approved where there is no alternative and it is a desperate situation.</td>
</tr>
</tbody>
</table>

C.2 Conflicting evaluations for the euthanasia issue

<table>
<thead>
<tr>
<th>Free choice versus religion</th>
</tr>
</thead>
<tbody>
<tr>
<td>My belief is that it is sometimes 'fairer' to put a person out of pain, but can see the issues in legalising euthanasia in that it is someone taking another’s life.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Life as precious and killing immoral vs. a life in extreme pain worse than death and free choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>My belief that you should be able to maintain a certain quality of life conflicts with ethical issues of having someone prescribe your death</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>My belief in the value of life conflicts with my feelings of sympathy for people who wish to die.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe one should decide whether they are to remain alive, in circumstances were they are experiencing so much pain they have no will to live, no one wants to see someone suffer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>My feelings of free will conflict with my beliefs relating to morality</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe in freedom of choice, if a person is suffering to the point of not being able to bear it, they should be able to end their own life, but it conflicts with my knowledge that often people are not of sound minds when going through certain stages of their life, and that the consequences are irreversible.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Should be used if for people who are extremely sick and who wish it upon themselves but</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>not for innocent people with no health problems</td>
</tr>
<tr>
<td>This conflicts with my feeling of fairness and equity</td>
</tr>
<tr>
<td>I believe that euthanasia should be available although I’m not totally sure about it is a contentious issue.</td>
</tr>
<tr>
<td>Conflicting because if someone is in pain and suffering, they should have the right to end their life, but on the flip side, what gives anyone the right to end someone's life, even if it is at their request. I agree with both sides of the argument.</td>
</tr>
<tr>
<td>I generally support the idea, I don't know if it could be practically implemented.</td>
</tr>
<tr>
<td>Predominantly positive I think for those with little quality of life it should be their right to leave the world peacefully and by choice. My problem with it is the regret that can be felt after making a decision, no one can ever be so certain they want to live, but this is coming from an 18yr old so for me life has so much left it is hard to imagine</td>
</tr>
<tr>
<td>I believe that if someone is in alot of pain and they have tried all their options with no success and no hope then they have the right to decide if they want to die. Then again no one has the right to take someone’s life if they are in for example a comma or if they are unable to communicate and do not have their permission.</td>
</tr>
<tr>
<td>Pos: When people become older and are forced to live with suffering and pain, maybe it would be easier to grant them euthanasia to alleviate their pain. Also, if someone wishes not to live, shouldn't they be able to die? Neg: It goes against the Bible.</td>
</tr>
<tr>
<td>I believe that people with terminal illnesses or who are living in a permanent vegetative state should be allowed to terminate their own life, however I believe that the use of euthanasia in any other situation is unacceptable.</td>
</tr>
</tbody>
</table>
## C.3 Conflicting evaluations for the Aboriginal Australians issue

<table>
<thead>
<tr>
<th>My belief of inequality and self-determinism</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe Aboriginal Australian should possess equal rights and should be free from persecution, oppression and discrimination</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>They have rights as people vs. their rights are perhaps too often placed ahead of those of the majority white population.</th>
</tr>
</thead>
<tbody>
<tr>
<td>My belief that they deserve rights conflicts with providing 'reverse discrimination'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I am not in the position to judge the free will of another person. Therefore I have no conflicting beliefs or feelings about it.</th>
</tr>
</thead>
<tbody>
<tr>
<td>My only concern is the fact that a proportion of the general public is so resentful to the welfare benefits they receive</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>My belief is that while fair treatment is a responsibility and a right, it is earned and should not be expected if certain behaviour doesn't warrant it, that being said equality should be assured to all.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that aboriginals have got many rights and are entitled to them but have focused on feeling sorry for themselves for too long.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>My belief that everything is caused conflicts with my feeling of my rights as a person with a racial background</th>
</tr>
</thead>
<tbody>
<tr>
<td>My support of the rights of aboriginal Australians is often conflicting with negative stereotypes and a lack of understanding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I believe they don't have enough acceptance or respect as a different race in human society. Yet it is nice to seem them glorified at rare times, but it is not done enough.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia as a nation has come along way over the years and therefore aboriginal rights have also evolved, positively, however the treatment of aboriginals before this evolution was extremely poor.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>While officially aboriginal Australians have had equal rights for some time, it does not seem to have helped them as a community especially in some rural areas where living conditions are well below the national average.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I'm happy with how far Australia has come in terms of the right of Aboriginal Australians, however the way we dealt with them in the past is not something to be proud of.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I know that Aboriginals were the original owners of this land but it would be very difficult for us, the ancestors of the white settlers, to just leave and start a fresh. It has been just too long. Though I believe we should have never have taken the land off the Aboriginals in the first place as we had no more right to live here than the Aboriginals.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pos: Because Aborigines have been wrongfully thrown out of their own land and have become a worse race because of such actions. Neg: Even though Aborigines have been displaced, they have the ability to fight for their rights and maintain a moral high ground, though many have taken to violence and alcoholism during their struggles, and have</td>
</tr>
</tbody>
</table>
affiliated them with a negative stereotype.

My beliefs are strongly felt due to my feelings of equality.

System doesn’t work, but they abuse the system

My feeling that everyone deserves equal rights is conflicted in this situation by a question of what equal rights are. I feel that some aboriginals are now being afforded greater or lesser rights as way of compensation.
Appendix D: Pilot study of attitude scales constructed by the binary tree method

The statements presented in Figures D1, D2 and D3 were constructed in accordance with the scaling constraint overviewed in Section 3.5. The following study was carried out to test individuals’ perceptions of the ordering of the statements.

D.1 Method

Participants

All participants ($n=25$) were first-year Psychology students at the University of Sydney who received partial course credit. There were 15 females and 12 males and the mean age was 20.4 ($SD = 3.50$). 22 of the 25 participants indicated English was their first language and all indicated English was their best language. The Mean rating of their ability to understand English was 4.79 out of 5 ($SD = .55$).

Materials

The main materials were the attitude scales presented in Figures D1, D2 and D3. The questionnaires were presented via computer using the Quask Formartist survey software (http://www.quask.com). Participants indicated their perception of the ordering of the statements via pair comparison judgements. The pair comparisons were counterbalanced using the optimum orders of Ross (1939).
MoA = morality of abortion
MA = morally acceptable
UC = universal choice
AP = always prohibited
E = encouraged
C = crime
A = all circumstances
M = murder

A. Abortion is extremely morally acceptable and should be a universal choice encouraged in all circumstances
B. Abortion is very morally acceptable and should be a universal choice that is encouraged, but not in all circumstances
C. Abortion is very morally acceptable and should be a universal choice, but I do not believe that it should ever be encouraged
D. Abortion is quite morally acceptable, but should not be a universal choice
E. Abortion is quite immoral, but should not be prohibited in some circumstances
F. Abortion is very immoral and should be prohibited, but should not be treated as a crime
G. Abortion is very immoral and should be both prohibited and treated as a crime, but not as a form of murder
H. Abortion is extremely immoral and should be prohibited, treated as a crime and as a form of murder

Figure D.1. Binary tree and resulting statements for the morality of abortion issue.
MoE = morality of euthanasia
MA = morally acceptable
UC = universal choice
AP = always prohibited
E = encouraged
C = crime
A = all circumstances
M = murder

A. Euthanasia is extremely morally acceptable and should be a universal choice encouraged in all circumstances
B. Euthanasia is very morally acceptable and should be a universal choice that is encouraged, but not in all circumstances
C. Euthanasia is very morally acceptable and should be a universal choice, but I do not believe that it should ever be encouraged
D. Euthanasia is quite morally acceptable, but should not be a universal choice
E. Euthanasia is quite immoral, but should not be prohibited in some circumstances
F. Euthanasia is very immoral and should be prohibited, but should not be treated as a crime
G. Euthanasia is very immoral and should be both prohibited and treated as a crime, but not as a form of murder
H. Euthanasia is extremely immoral and should be prohibited, treated as a crime and as a form of murder

Figure D.2. Binary tree and resulting statements for the morality of euthanasia issue.
EoA = equality of Aboriginal Australians
HE = helped to become more equal
EA = more economic assistance
AR = always responsible for disadvantage
PI = more political influence
CU = can’t understand their anger
SL = sacred land to self-govern
AI = always inferior

A. Aboriginal Australians should be helped to become more equal and thus receive more economic assistance, political influence and should be given land to self-govern
B. Aboriginal Australians should be helped to become more equal and thus receive greater economic assistance and political influence, but they should not be given land to self-govern
C. Aboriginal Australians should be helped to become more equal and thus receive greater economic assistance, but they should not have more political influence
D. Aboriginal Australians should be helped to become more equal, but they do receive more economic assistance than they deserve
E. Aboriginal Australians should not be helped to become more equal, but they are not solely responsible for their social disadvantage
F. Aboriginal Australians should not be helped to become more equal and are responsible for their own disadvantage, but I can understand their anger
G. Aboriginal Australians should not be helped to become more equal as they are particularly responsible for their disadvantage and I cannot understand their anger, but I do not believe they are inferior
H. Aboriginal Australians should not be helped to become more equal as they are extremely responsible for their own disadvantage and thus I cannot understand their anger and I believe they are inferior

Figure D.3. Binary tree and resulting statements for the equality of Aboriginal Australians issue.
Procedure

Participants were tested in groups ranging from 2 to 8 individuals in size. At the beginning of the testing session, participants were given a general introduction to the purpose of the study as well as the relevant ethical information. In addition, they were instructed to carefully follow all instructions provided and to ask for clarification from the experimenter if they were unsure about either of the tasks. Participants then completed the three tasks via computer. Upon completion they were provided with a thorough debriefing of the study.

D.2 Results and Discussion

There were two types of errors possible in individuals’ ordering judgements in this task, intransitive judgement and ordering errors.

For the morality of abortion issue, 17 out of 25 (67%) individuals indicated a perception of the ordering consistent with the predicted statement ordering. There were 10 intransitive judgement errors and 29 ordering errors. So, 39 of the 700 (5.57%) pair comparisons made across all participants were inconsistent with the predicted ordering of the statements.

For the morality of euthanasia issue, 16 out of 25 (64%) individuals indicated a perception of the ordering consistent with the predicted statement ordering. There were 11 intransitive judgement errors and 32 ordering errors. So, 43 of the 700 (6.14%) pair comparisons made across all participants were inconsistent with the predicted ordering of the statements.

For the equality Aboriginal Australians issue, 14 out of 25 (56%) individuals indicated a perception of the ordering consistent with the predicted statement ordering. There were 14 intransitive judgement errors and 28 ordering errors.
Consequently, 42 of the 700 (6\%) pair comparisons made across all participants were inconsistent with the predicted ordering of the statements.

These systematically high levels of ordering errors indicated problems with the semantic ordering of the statements across the three issues. These errors are set out in Table D.1.

For the abortion issues, the ordering errors were particularly clustered around the CD (34\%), CE (17\%) and DE (17\%) statement pairs. It appears that the weight of the ‘do not believe that it should be encouraged’ predicate of Statement C made it appear more negative toward a significant number of respondents than Statement D, and to a lesser extent Statement E. This predicate was appended to Statement D in the statements presented in Chapter 3 to correct for this. Furthermore, it appears that the ‘should not be a universal choice’ predicate of Statement D made it appear more negative than Statement E for a substantial number of respondents. Given this, the unfavourable nature of Statement E was emphasised for the statements presented in Chapter 3 by changing the predicate to, ‘prohibited in most circumstances’. Further general changes were made to the statements presented in Chapter 3 to accentuate the ordering. The pattern of ordering errors for the euthanasia statements was very similar and so equivalent changes to the abortion issue were applied in Chapter 3.

For the Aboriginal Australians issues, the majority of ordering errors were committed on the EF (43\%) and BC (25\%) statement pairs. It appears that for a significant proportion of respondents the semantic weight of the ‘can understand their anger’ predicate of Statement F made it appear more positive than Statement E. Thus, it was appended to Statement E in Chapter 3. Furthermore, the ordering of Statements B and C was emphasised by changing the predicate of Statement B to read, ‘should be given free use of their sacred land’.
Table D.1

*Intransitive judgement (Int.) and ordering (O.) errors in ordering judgements of the Abortion (AN), Euthanasia (EU) and Aboriginal Australians (AA) statements.*

<table>
<thead>
<tr>
<th>Statement Pairs</th>
<th>AN</th>
<th>EU</th>
<th>AA</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>AC</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>AD</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>AE</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>AF</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>AG</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>AH</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BC</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>BD</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>BE</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BG</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BH</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CD</td>
<td>0</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>CE</td>
<td>1</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>CF</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>CG</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CH</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DE</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>DF</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>DG</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DH</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EF</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EG</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EH</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FG</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>FH</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>GH</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10</td>
<td>29</td>
<td>11</td>
</tr>
</tbody>
</table>
Appendix E: Validation of attitude intensity and subjective ambivalence scales

In addition to the sets of attitude statements constructed in Chapter 3, it was necessary to construct scales to assess the attitude intensity parameter and subjective reports of ambivalence\textsuperscript{10}, which were raised in Chapters 1 and 2. Measure of these will be utilised in the analyses of Chapter 5, which assumes that they are quantitatively structured, and thus responses to them must also be shown to be conform to Coombs’ (1964) model. Like the attitude statements in Chapter 3, these scales were constructed utilising the binary tree method.

E.1 The construction and validation of the attitude intensity and subjective ambivalence scales

\textit{E.1.1 The attitude intensity scale}

This scale was adopted from the work of Davies (2004). She demonstrated that this scale successfully ordered individuals’ levels of attitude intensity. The scale was designed to firstly differentiate individuals who indicate that they feel indifferent toward or do not care about the issue from those who indicate that they do care. Then, further levels were added to distinguish between the different strengths of

\textsuperscript{10} Referred to as meta-psychological ambivalence in Chapter 5.
caring. This was done in accordance with the scaling constraint explained in Section 3.5. The derivation and items of the scale are presented in Figure E.1 below.

AI = attitude intensity
I = Indifferent toward the issue
DC = Do not particularly care about the issue
NA = Do not care a lot about the issue
NP = Do not care passionately about the issue
NS = Do not feel more strongly about the issue than any other

A. I feel complete indifference toward this issue.
B. I do not particularly care about this issue.
C. I care about this issue
D. I care a lot about this issue.
E. I feel passionately about this issue.
F. I feel more strongly about this issue than any other.

*Figure E.1.* Binary tree and resulting statements for the attitude intensity scale.
E.1.2 The subjective ambivalence scale

This scale was based upon the single-item rating tasks typically used to assess subjective reports of ambivalence (Conner & Armitage, 2008). These tasks ask individuals to report how ‘mixed’, ‘conflicted’ or ‘indecisive’ their attitude is toward the issue. Specifically, the ‘mixed’ item was the focus as it was particularly consistent with the conceptualisation of ambivalence presented in previous chapters. As with the attitude intensity scale, this was done in accordance with the scaling constraint explained in Section 3.5. The derivation and final items of the scale are presented in Figure E.2. Again some license is taken with the wording of the items in order to ensure their ordering is accurately interpreted. For example, Statement D does not include the ‘very mixed, but not extremely mixed’ wording suggested by the binary tree as it relies upon the difference in the semantic strength between the adverbs ‘very’ and ‘extremely’ to imply the ordering. This simplifies the interpretation of the statement.
SA = Subjective ambivalence  
M = Attitude is mixed  
P = Particularly  
V = Very  
E = Extremely  
I = Impossible to be more mixed  

A. My attitude toward this issue is not mixed at all.  
B. My attitude toward this issue is not particularly mixed.  
C. My attitude toward this issue is mixed.  
D. My attitude toward this issue is very mixed.  
E. My attitude toward this issue is extremely mixed.  
F. It is impossible for my attitude toward this issue to be any more mixed.

*Figure E.2. Binary tree and resulting statements for the subjective ambivalence scale.*
E.1.3 Method

Participants

All participants (n=55) were first-year Psychology students at the University of Sydney who received partial course credit. There were 32 females and 23 males and the mean age was 20.13 (SD = 4.27). 37 of the 55 participants indicated English was their first language and 47 indicated English was their best language. The Mean rating of their ability to understand English was 4.68 out of 5 (SD = .52).

Materials

The materials were the attitude intensity and subjective ambivalence scales presented in Figures E.1 and E.2. The questionnaires were presented via computer using the Quask Formartist survey software (http://www.quask.com). Participants indicated their preferences of the attitude scale statements via pair comparison judgements. They were instructed for each pair of statements to choose the one that most reflected the state of their attitude toward abortion. This issue was selected as the analyses of Chapters 2, 3 and 4 indicated that a significant proportion of people tend to care about this issue and it is also subject to a lot of ambivalent evaluations. The pair comparisons were counterbalanced using the optimum orders of Ross (1939).

Procedure

Participants were tested in groups ranging from 2 to 8 individuals in size. Participants were given a general introduction to the purpose of the study as well as the relevant ethical information at the beginning of the session. It was stressed to them that they must follow the instructions carefully and to ask the experimenter if any clarification of the task was required. Participants then completed the two tasks
via computer. Upon completion they were provided with a thorough debriefing of the study.

_E.1.4 Results and Discussion_

For the attitude intensity scale, 53 (3.4%) judgements were intransitive, constituting 66% of the overall error rate. The BF (21%) and AE (18%) statement pairs demonstrated the highest prevalence of intransitive judgements. Ten (0.6%) judgements were folding errors, constituting 13% of the overall error rate. Five of these errors involved the DE statement pair. Finally, there were 17 (1.1%) single-path errors, constituting 21% of the overall error rate. There was no clear localization of these errors. This was an overall error rate of 5.1%. The single-path and resulting ordered metric solution is presented in Figure E.3.

The inter-statement midpoint ordering of the attitude intensity scale was also found to satisfy the cancellation condition. This test is presented in Figure E.4. These results indicate that this scale accords with Coombs’ (1964) unidimensional unfolding model. This supports the assumption that the attitude intensity parameter is quantitatively structured and provides evidence that it is appropriate to include it in the SEM analyses of Chapter 5. It should be noted that Davies (2004) only found this scale to be ordinal. However, she relied upon rankings of the scale and this methodology has been shown to be subjected to far more erroneous judgements because of its more taxing nature (Michell, 1994, 1998).
Figure E.3. The single-path through the proximity graph for the attitude intensity scale with black arrows marking the dominant path and green arrows marking the arbitrary path, the frequency of the preference orders and the ordered-metric solution obtained from the midpoint ordering.
For the subjective ambivalence scale, 42 (2.7%) judgements were intransitive, composing 51% of the overall error rate. The highest prevalence was for the BF (32%) and AE (16%) statement pairs. Six (0.4%) judgements were in violation of the folding condition, making up 7% of the overall error rate. Three of these were for the AB statement pair. Thirty-five (2.3%) judgements were in violation of the single-path condition, constituting 42% of the overall error rate. The single-path errors were most prevalent with the AF and BE statement pairs. This was an overall error rate of 5.4%.

The inter-statement midpoint ordering of the subjective ambivalence scale was also found to satisfy the cancellation condition. This test is presented in Figure E.5. These results indicate that this scale accords with Coombs’ (1964) unidimensional unfolding model. This supports the assumption that the attitude intensity parameter is quantitatively structured and provides evidence that it is appropriate to include it in the SEM analyses of Chapter 5.
Figure E.5. The single-path through the proximity graph for the subjective ambivalence scale with black arrows marking the dominant path and green arrows marking the arbitrary path, the frequency of the preference orders and the ordered-metric solution obtained from the midpoint ordering.
Figure E.6. Tests of double cancellation for the subjective ambivalence scale.

Although the above results provide evidence that the attitude intensity and meta-psychological ambivalence parameters are both ordinally and additively structures, further research is obviously required. The current study only utilised these scales with respect to a single attitude issue and the generalisability of the findings given the small sample size is questionable. Nonetheless, any attempt to test this assumption is novel in the SEM literature.
Appendix F: Rating judgements analysis from Chapter 5

Table F.1

Frequencies of folding (F.) and single-path (SP) errors for the rating judgements of Chapter 5 for the abortion (AN), euthanasia (EU) and Aboriginal Australians (AA) issues.

<table>
<thead>
<tr>
<th>Statement</th>
<th>AN</th>
<th>EU</th>
<th>AA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pairs</td>
<td>F.</td>
<td>SP</td>
<td>F.</td>
</tr>
<tr>
<td>AB</td>
<td>4</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>AC</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AD</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>AE</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AF</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>BC</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>BD</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BF</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>CD</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>CE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CF</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>DE</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>DF</td>
<td>2</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>EF</td>
<td>17</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>11</td>
<td>52</td>
</tr>
</tbody>
</table>
F.1 Explanation of scoring the rating preference orders

As explained in Chapter 5, the scoring of the rating preference orders is more complicated as ties are permitted, i.e., the same rating may be provided to more than one statement. So, if for the abortion issue a participant provided a rating of ‘9’ for Statements A and B, and a rating of ‘7’ for C, ‘5’ for D, ‘2’ for E and ‘1’ for F, they would be allocated the preference order (AB)CDEF. The brackets acknowledge that the ratings do not differentiate a preference for A or B. Consequently, their preference order could be interpreted as ABCDEF or BACDEF. According to the ordered metric solution provided in Figure F.1, the ABCDEF preference order covers the interval between the locations of Statement A and the AB midpoint. Typically it is allocated the value for the midpoint of that interval, which in this case would be 0.75. The BACDEF preference order covers the interval between the locations of the AB and AC midpoints, and thus would be allocated a value of 3.5. Thus, the (AB)CDEF preference order covers the interval between the locations of Statement A and the AC midpoint, and would be allocated the value 2.75.

\[ \begin{array}{ccccccccccc}
AB & AC & BC & AD & BD & AE & AFBE & BFCD & CE & CF & DE & DF & EF \\
0 & 3 & 11 & 16 & 21 & 23 & & & & & & & \\
A & B & C & D & E & F & & & & & & & \\
\end{array} \]

*Figure F.1.* Ordered-metric solution obtained from the midpoint ordering implied by the rating judgements for the Abortion issue.
Appendix G: Ethics approval

All research studies were carried out in accordance with the approved protocol from the University of Sydney Human Research Ethics Committee. Figure G.1 presents a copy of the original letter of approval. All subsequent studies were done on the basis of modifications to this protocol.
08 July 2004

Dr F White
School of Psychology
Building A17
The University of Sydney

Dear Dr White

I am pleased to inform you that the Human Research Ethics Committee at its meeting on 28 June 2004 approved your protocol entitled “The significance of attitudinal ambivalence to attitude theory and measurement - (Study I)”.

To comply with the National Statement on Ethical Conduct in Research Involving Humans, and in line with the Human Research Ethics Committee requirements this approval is for a 12-month period. At the end of the approval period, the HREC will approve extensions for a further 12-month, subject to a satisfactory annual report. The HREC will forward to you an Annual Progress Report form, at the end of each 12-month period. Your first report will be due on 30 June 2005.

Details of the approval are as follows:

Ref No.: 7600
Approval Period: June 2004 – June 2005
Authorised Personnel: Dr F White
Mr J McGrane

Conditions of Approval Applicable to all Projects

(1) The individual researcher’s protocol complies with the final and the Committee approved protocol.

(2) Modifications to the protocol cannot proceed until such approval is obtained in writing.

Figure G.1. Copy of original ethics approval letter.