Does attitudinal ambivalence necessitate the bivariate measurement of attitudes? An application of the quasi-Rasch Hyperbolic Cosine Model

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Since the seminal work of Thurstone (1928), attitudes have been conceptualised as bipolar constructs and attempts at measurement have been in accordance with this. More recently, Cacioppo and his colleagues (1994; 1997; 1999) have argued that this bipolar model, although intuitively appealing, should be replaced by a bivariate understanding, whereby the positive and negative substrates of attitudes are treated as and measured independently. A key rationale for their argument has been that these bipolar models have precluded the measurement of ambivalent attitudes. This study rejects this assertion and argues that the ignorance of ambivalence has been an artefact of treating bipolarity as necessitating an exclusively reciprocal relationship between the polar elements, and the evidence in support of bivariate measurement is undermined by the linear relationships presumed by the correlational and factor analytic approaches typically used. Furthermore, it is argued that under an unfolding approach, ambivalent attitudes are entirely consistent with a bipolar conceptualisation. To demonstrate this, a number of versions of the primary measure developed out of the bivariate approach, which includes positive, negative and ambivalent subscales, were administered to 121 introductory psychology students at the University of Sydney to assess their attitudes toward abortion, Indigenous Australians and homosexuality. Results of the correlational and factor analyses for each of the issues were consistent with the bivariate interpretation with all three subscales only loading substantially on to single, separate factors. However, the solutions obtained from the non-linear unfolding Hyperbolic Cosine Model more parsimoniously suggested that each of the subscales fit a unidimensional, bipolar continuum, with the ambivalent items located approximately at the centre. Thus, it is argued that attitudinal ambivalence does not necessitate the abandonment of bipolar measures of attitudes. Rather, it requires the abandonment of the method of summated ratings in favour of unfolding analysis.

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Since Thurstone (1928) first declared that attitudes can be measured, the evaluative continuum has been conceptualised as bipolar in structure. Such a framework seems plausible as many such dichotomies exist around us in every day life. The lay person and social scientist alike tend to think in terms of good versus evil, liberal versus conservative, hot versus cold (Thompson, Zanna & Griffin, 1995). 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 John Cacioppo and his colleagues (Cacioppo & Bernston, 1994; Cacioppo, Gardner & Berntson, 1997, 1999). In the presidential address to the Society for Personality and Social Psychology, Cacioppo et al. (1997) tolled what they saw as the death knell for the bipolar measurement of attitudes, citing a number of studies which they argue demonstrate the inadequacy of bipolar models. In particular, psychometric examinations of the relationship between measures of positive and negative evaluations do not typically indicate the strong inverse relationship presumed to be an implicit part of the bipolar understanding. This research will argue that such evidence cannot be treated as conclusive as it is undermined by its assumption that linear analyses are appropriate for analysing bipolar concepts (van Schuur & Kiers, 1993). Furthermore, it will attempt to empirically demonstrate that the non-reciprocal relationship between positive and negative evaluations represented by attitudinal ambivalence is consistent with a unidimensional, bipolar continuum by analysing a number of sets of attitude responses utilising the unfolding Hyperbolic Cosine Model.

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. 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. 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. The exact nature of this 'neutral' zone has long been the subject of debate (Edwards & Ostrom, 1971). However, given their reciprocal definition it appears evident that they take it to be 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 whereby an individual simultaneously possesses both positive and negative evaluations. This leads them to conclude that a two-dimensional representation of attitude space is minimally 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[2]. 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 (Cacioppo et al., 1997; Patchen, Hofman & Davidson, 1976). 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, Cacioppo et al. (1997) argue that bipolar measurement scales must be abandoned in favour of the sort of bivariate scales utilised in their own research. The first scale designed exclusively for the assessment of attitudes under the bivariate approach is the Bivariate Evaluations and Ambivalence Measures (BEAMs).

Closer scrutiny of the evidence for Cacioppo et al.'s (1997) claim supports the notion that attitude measurement needs to move beyond the existing bipolar measures. However, it is unclear that bipolar measurement needs to be abandoned altogether. Whilst these two statements may appear at face value contradictory, it is the postulation of this paper that the bipolar continuum implicitly accepted by attitude researchers for close to a century is in fact artificial. This is made clear by considering any number of bipolar analogies. One such analogy invoked by Cacioppo et al. is the balance knob on an audio stereo. 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. Similarly, when considering the analogy of the 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. is implicitly bivariate. To achieve the analogous state of attitudinal indifference in the stereo example would require two unipolar balance knobs for each channel. For the water temperature example, one requires both a hot and a cold tap. It appears that the attitudinal state at the centre of the evaluative bipolar continuum should be interpreted as a 'mixing' of the polar elements, or attitudinal ambivalence. If this is empirically verified, it will greatly undermine the assertion that ambivalence is irreconcilable with the bipolar conceptualisation of attitudes.

Furthermore, the psychometric evidence for a bivariate understanding is undermined by its reliance upon linear analyses of the relationship between positive and negative evaluations. The use of such linear analyses as correlations and factor analysis to confirm bivariate models has been repeatedly criticised in a parallel debate in the affect literature. These criticisms have included these studies' disregard for the obscuring effect of

[2] Cacioppo et al.'s (1997) two-dimensional representation also allows an uncoupled relationship whereby changes in positive evaluations are independent of negative evaluations and vice-versa. The evidence for this sort of relationship is again mostly correlational and thus open to many of the criticisms raised in this paper. However, this issue will not be directly addressed for brevity's sake.

measurement error (Green, Goldman & Salovey, 1993), as well as the attenuating effect of ambiguous response formats on correlational analyses (Russell & Carroll, 1999). It is curious that Cacioppo et al. (1997) report such analyses as conclusive given that their own review cites the Green et al. paper.

Of most relevance to the current research is the criticism by van Schuur and Kiers (1994) 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. When a dataset conforms to a unidimensional unfolding model this relationship is more akin to a quadratic, or single-peaked, function. This is because in the unfolding model individuals' responses are contingent upon the distance between their locations 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 location is sufficiently close. So in terms of correlational analyses, only items which 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 the factor analytic solution, van Schuur and Kiers point out that an unfoldable dataset will manifest an extra, artificial factor. They suggest this phenomenon is the most parsimonious explanation of the bivariate solution obtained in studies of the structure of affect. Therefore, if it can be empirically shown that responses to a bivariate attitude measure fit a unidimensional unfolding model, then correlational or factor analyses of this measure can no longer be interpreted as compelling evidence for the bivariate interpretation. The current study will utilise the quasi-Rasch unfolding Hyperbolic Cosine Model for this purpose (Andrich & Luo, 1993).

The Hyperbolic Cosine Model (HCM) and the superiority of the unfolding approach

Developed in the Rasch tradition, the HCM approaches preferential judgement behaviour as being governed by the abovementioned single-peaked preference function. This single-peakedness is naturally captured by the hyperbolic cosine function. It is a probabilistic measurement model and thus tolerant of measurement error as long as such error accords with the assumptions of the model. This is an important point as given the model is falsifiable it is meaningful to ask whether preference responses fit the unfolding model. Fit statistics have been developed to aid this interpretation (Andrich, 1978).

The hypothesised ideal-point response process of the unfolding approach affords it a number of superiorities over the method of summated ratings (Likert, 1932). In particular, unfolding models allow and encourage the provision of items from the entire span of the attitude dimension. Roberts, Laughlin and Wedell (1999) point out that traditional scaling techniques only lead to the inclusion of moderately located items which are either clearly positive or negative in nature. This is because the response process assumed by the method of summated ratings and related IRT dominance models is not consistent with the response behaviour exhibited on more 'neutral' or extreme items. Roberts et al. argue that this requirement leads to the underestimation of the attitudes of individuals located at the extremes of the continuum. It is the thesis of this

paper that this requirement equally prohibits these bipolar models from capturing ambivalent attitudes.

The preclusion of the sort of 'neutral' items which 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 empirical unfolding applications. For example, Andrich (1988, p.47) addressed participants' attitudes toward capital punishment using such statements drawn from the original work of Thurstone 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". Responses to such items are typically at their peak amongst individuals whom are located at the centre of the latent continuum. Thus, it can be seen that implicit within these studies is a conceptualisation of the bipolar evaluative continuum which is consistent with that proposed in this research and their findings appear to provide empirical validation of this conceptualisation. This study will attempt to extend this validation and provide refutation of Cacioppo et al.'s (1997) argument by performing unfolding analysis on their abovementioned BEAMs measure, which includes positivity, negativity and ambivalence subscales.

Aims and Hypotheses

The primary aim of this paper is to demonstrate that ambivalence does not necessitate the bivariate measurement of attitudes under an unfolding approach and empirically verify the alternative conceptualisation of the bipolar evaluative continuum proposed. It is expected that the linear analyses of the responses to the BEAMs will be consistent with the past findings and interpretations of Cacioppo et al., whereby there will be few strong negative correlations between the items of the positive and negative subscales and each of the subscales will load on to separate factors. Furthermore, it is expected that the subscales will adequately fit the bipolar, unidimensional HCM. Given this measure was created utilising traditional scaling techniques it is expected that the items of the positive and negative subscales will be positioned at close, moderate locations on their respective pole. In addition, it is expected that the items of the ambivalent subscale will be located toward the centre of the evaluative continuum.

Method

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 with a mean of 19.18. All participants received partial course credit in return for their participation.

Materials

This study utilised Cacioppo et al.'s (1997) Bivariate Evaluations and Ambivalence Measures to assess attitudes toward abortion, Indigenous Australians and homosexuality. This scale consists of three subscales designed to assess levels of positive evaluations, levels of negative evaluations and levels of ambivalent evaluations in a unipolar manner. 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 Indigenous Australians. Both forms have been found in the past to be statistically equivalent (Cacioppo et al., 1997). The items which constitute the subscales are set out in Table 1 below.

Table 1.
Items from the BEAMs positive, negative and ambivalent subscales.

Positive		Negative		Ambivalent
A	B	A	B	A/B
Favourable	Desirable	Undesirable	Unfavourable	Muddled
Appealing	Positive	Negative	Unappealing	Jumbled
Pleasant	Likable	Unlikable	Unpleasant	Tense
Agreeable	Happy	Unhappy	Disagreeable	Conflicted
Approving	Supporting	Opposing	Disapproving	Divided
Rewarding	Good	Bad	Punishing	Contradictory
Delighted	Attractive	Unattractive	Distressed	
Comfortable	Satisfying	Unsatisfying	Uncomfortable	

The different forms were utilised in order to minimise participants treating the unipolar scales as bipolar scales. In addition, the subscales were completed individually and administration of each subscale was separated by a filler task which involved verbal comprehension. The use of the forms was split across the attitude issues rather than the sample in order to maximise the numbers for the unfolding analysis for each issue. Participants were given the attitude issue (e.g. abortion) and were asked to rate the extent to which each of the scale items (e.g. favourable, appealing etc. for the positive subscale) reflected their own attitude toward each of the issues on a scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). The reliability coefficients obtained for each of the subscales and each of the forms were all acceptable, ranging from .81 to .92.

Procedure

Participants were tested in groups which ranged in size from 2 to 10 people. All questionnaires were administered via computer using the Quask Formartist questionnaire design software. Participants were provided with a thorough debriefing of the purposes of the study once all questionnaires were completed.

Results

The dataset was initially subjected to the traditional linear analyses in SPSS for Windows Release 14 (2005), including correlational and factor analysis, to confirm that it

was in accordance with the conventional bivariate interpretation. Table 2 presents the correlations between the positive and negative subscales of the abortion BEAMs.

Table 2.
Correlation matrix between the BEAMs positive and negative subscale items for the Abortion issue.

	Valence															
Valence	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-
+	-															
+	0.66	-														
+	0.17	0.33	-													
+	0.53	0.45	0.09	-												
+	0.65	0.52	0.13	0.73	-											
+	0.46	0.46	0.23	0.35	0.60	-										
+	0.36	0.46	0.31	0.22	0.41	0.58	-									
+	0.35	0.42	0.21	0.39	0.39	0.33	0.12	-								
-	-0.46	-0.57	-0.24	-0.38	-0.42	-0.37	-0.31	-0.37	-							
-	-0.60	-0.36	-0.15	-0.46	-0.54	-0.36	-0.23	-0.29	0.60	-						
-	-0.60	-0.42	-0.12	-0.45	-0.59	-0.35	-0.27	-0.34	0.62	0.84	-					
-	-0.40	-0.35	-0.17	-0.35	-0.47	-0.35	-0.24	-0.41	0.60	0.55	0.59	-				
-	-0.40	-0.30	-0.03	-0.36	-0.47	-0.25	-0.13	-0.26	0.55	0.62	0.69	0.58	-			
-	-0.51	-0.38	-0.03	-0.44	-0.54	-0.34	-0.20	-0.26	0.62	0.77	0.76	0.56	0.77	-		
-	-0.29	-0.27	0.00	-0.21	-0.31	-0.21	-0.10	-0.24	0.53	0.55	0.59	0.44	0.55	0.53	-	
-	-0.26	-0.34	-0.06	-0.22	-0.33	-0.25	-0.26	-0.23	0.56	0.40	0.48	0.64	0.60	0.57	0.44	-

As predicted, the overall inspection of the pattern of correlations between the oppositely valenced items reveals no strong linear relationship, with correlations ranging from absent to only moderate in strength. Under the conventional understanding, these findings are interpreted as supporting a bivariate conceptualisation. The patterns of correlations were equivocal for the other attitude issues and thus will not be elaborated. Refer to the Appendix for the relevant correlation matrices.

Additionally, in accordance with past findings and the current prediction, the results of the factor analyses revealed a three factor solution for each of the issues, with the BEAMs subscales only loading substantially on to single, separate factors. The loadings for the abortion BEAMs are presented in Table 3 demonstrating separate negativity, positivity and ambivalence factors.

Table 3.
Varimax factor loadings of the BEAMs positive, negative and ambivalent subscale items for the abortion issue.

Item	Factor 1	Factor 2	Factor 3
Positive			
Favourable	-0.52	***0.59***	0.03
Appealing	-0.30	***0.73***	-0.08
Pleasant	0.12	***0.56***	-0.10
Agreeable	-0.47	***0.50***	0.06
Approving	-0.54	***0.62***	-0.01
Rewarding	-0.21	***0.72***	-0.10
Delighted	-0.04	***0.71***	-0.10
Comfortable	-0.29	***0.47***	-0.09
Negative			
Undesirable	***0.62***	-0.37	0.29
Negative	***0.83***	-0.23	0.06
Unlikable	***0.85***	-0.25	0.13
Unhappy	***0.62***	-0.28	0.34
Opposing	***0.81***	-0.05	0.28
Bad	***0.86***	-0.15	0.16
Unattractive	***0.67***	0.01	0.29
Unsatisfying	***0.57***	-0.13	0.39
Ambivalent			
Muddled	0.02	-0.01	***0.84***
Jumbled	0.15	0.09	***0.82***
Tense	0.28	-0.19	***0.66***
Conflicted	0.10	-0.25	***0.78***
Divided	0.19	-0.03	***0.77***
Contradictory	0.26	-0.12	***0.68***

The eigenvalues of each of the factors were 8.45, 3.02 and 1.79 respectively and the final solution explained 60.26% of the overall variance. The solutions obtained for the other issues were equivalent and thus will not be elaborated. See the Appendix for the details of these analyses. Similarly, further analyses excluding the ambivalence BEAMs subscale for each of the issues revealed a two-factor solution with the positive and negative BEAMs subscales loading on to two distinct factors (See Appendix). This confirmed that the inclusion of the ambivalence subscale was not responsible for the distinct loadings of the positive and negative items in the abovementioned factorial structure.

After demonstrating the data's comparability with past findings and seeming support for the bivariate interpretation, the unfolding analyses were performed using Luo's (2002) RateFOLD2002 version 2.03 software. The scaling solutions and tests of fit for the items of the BEAMs for each of the attitude issues are presented in Tables 4, 5 and 6 below. Overall, the BEAMs' fit to the Hyperbolic Cosine Model were acceptable.

Table 4.
The Hyperbolic Cosine Model scaling solution and test of fit for the abortion BEAMs with items in location order.

Item	Location	χ^2	Probability
Delighted	2.890	4.34	0.99
Comfortable	2.845	13.00	0.67
Pleasant	2.797	17.07	0.38
Rewarding	2.746	18.47	0.30
Appealing	2.676	12.70	0.69
Approving	2.610	11.74	0.76
Agreeable	2.287	25.66	0.06
Favorable	2.190	13.10	0.67
Jumbled	-0.928	21.92	0.15
Conflicted	-0.933	27.49	0.04
Muddled	-0.947	31.71	0.01
Divided	-1.000	16.34	0.43
Contradictory	-1.010	32.25	0.01
Tense	-1.334	7.00	0.97
Unattractive	-1.414	14.52	0.56
Unsatisfying	-1.561	23.20	0.11
Undesirable	-1.733	21.73	0.15
Unhappy	-1.782	19.47	0.24
Opposing	-1.870	8.93	0.92
Bad	-2.043	9.96	0.87
Unlikable	-2.222	14.36	0.57
Negative	-2.263	9.86	0.87

The solution obtained for the abortion BEAMs was consistent with predictions. Inspection of Table 4 reveals that the items of the positive subscale are located at one end of the latent continuum, the negative subscale items at the other, and most importantly the ambivalent subscale items are located toward the centre of the continuum, although somewhat more to the negative end than expected. Individuals tests of fit utilising Andrich's (1978) χ^2 revealed that all items' fit to the model were acceptable. Furthermore, the overall test of fit concluded that the abortion BEAMs subscales may be reasonably accepted to accord to the unidimensional, bipolar HCM, $\chi^2_{351} = 374.80$, $p = 0.18$. Figure 1 presents item expectation curves for an item from each of the abortion BEAMs subscales to demonstrate the systematic non-linear relationship between the attitude responses.

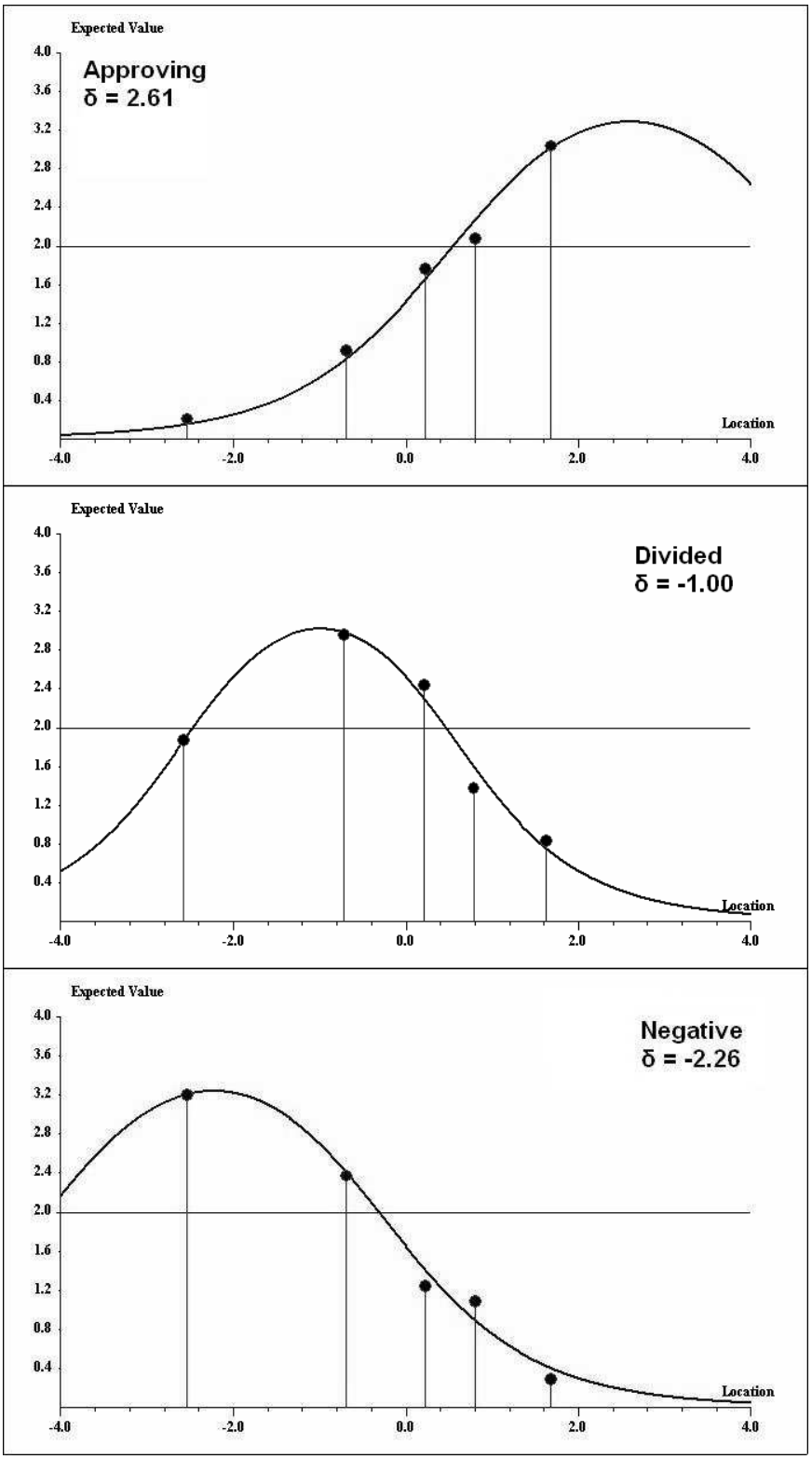

Figure 1. Item expectation curves from the abortion BEAMs including the positive item approving, ambivalent item divided, and negative item negative.

Similarly, the χ^2 overall test of fit for the Indigenous Australians BEAMs was not statistically significant, thus indicating that the data adequately fit the HCM, $\chi^2_{263} = 302.18$, $p = .05$.

Table 5.
The Hyperbolic Cosine Model scaling solution and test of fit for the Indigenous Australians BEAMs with items in location order.

Item	Location	χ^2	Probability
Happy	2.329	14.18	0.29
Desirable	2.15	19.70	0.07
Likable	2.141	9.66	0.65
Good	2.117	15.74	0.20
Positive	1.976	18.01	0.12
Attractive	1.923	14.31	0.28
Satisfying	1.848	10.96	0.53
Supporting	1.685	15.39	0.22
Jumbled	-0.321	12.05	0.44
Conflicted	-0.346	26.95	0.01
Muddled	-0.547	22.57	0.03
Divided	-0.629	15.34	0.22
Contradictory	-1	15.57	0.21
Tense	-1.089	15.11	0.24
Uncomfortable	-1.162	14.30	0.28
Unappealing	-1.189	20.34	0.06
Unpleasant	-1.211	4.90	0.96
Disagreeable	-1.249	10.40	0.58
Unfavourable	-1.497	10.61	0.56
Disapproving	-1.524	6.96	0.86
Punishing	-2.166	4.36	0.98
Distressed	-2.238	4.79	0.96

The overall test of fit for the homosexuality BEAMs did not suggest that overall the measure is consistent with the HCM, $\chi^2_{351} = 444.89$, $p = .00$. However, inspection of Table 6 below reveals that a large proportion of the items do appear to fit the HCM.

Table 6.
The Hyperbolic Cosine Model scaling solution and test of fit for the Homosexuality BEAMs with items in location order.

Item	Location	χ^2	Probability
Rewarding	3.202	14.25	0.58
Appealing	3.134	34.87	0.00
Favorable	2.858	26.13	0.05
Pleasant	2.842	27.10	0.04
Approving	2.806	11.17	0.80
Delighted	2.8	42.34	0.00
Comfortable	2.631	12.70	0.69
Agreeable	2.624	20.99	0.18
Muddled	-1.079	19.12	0.26
Conflicted	-1.106	18.19	0.31
Contradictory	-1.121	9.88	0.87
Tense	-1.213	27.27	0.04
Divided	-1.221	29.67	0.02
Jumbled	-1.226	22.18	0.14
Unsatisfying	-1.561	19.21	0.26
Unattractive	-1.76	22.18	0.14
Unhappy	-1.778	5.59	0.99
Opposing	-1.792	13.51	0.63
Undesirable	-1.998	30.40	0.02
Unlikable	-2.217	8.89	0.92
Negative	-2.345	18.80	0.28
Bad	-2.481	10.55	0.84

The statement maps for each of the issues presented in Figure 2 below illustrate the location of the BEAMs items relative to the person distribution. As predicted, the items of each subscale are quite bunched together and the negative subscale items are all moderately located. However, the ambivalent subscale items are more proximal to the negative end of the continuum than expected and the positive subscale items for the abortion and homosexuality issues are reasonably extreme. Of the three issues, the distributions of items for the Indigenous Australians BEAMs are most in accordance with the study's predictions. Interestingly, for all three issues, the largest frequencies of persons are situated at a location on the latent continuum where there are no items.

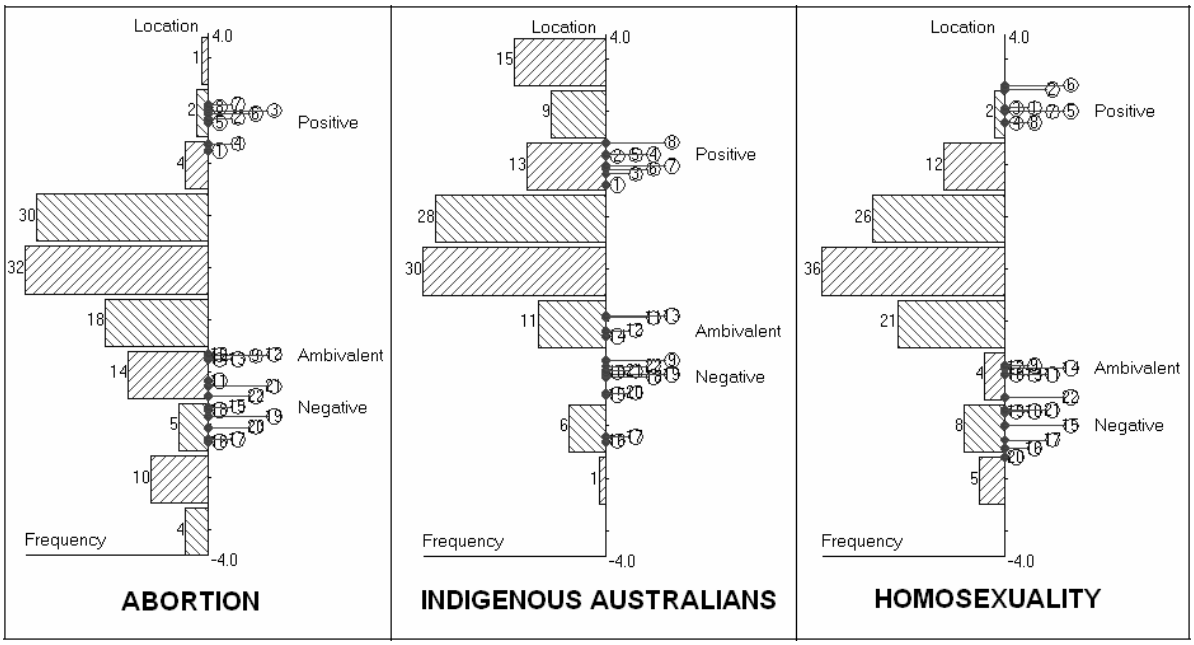

Figure 2. Statement maps showing the location of the BEAMs subscale items relative to the frequency distribution of person locations on the latent continuum for the abortion, Indigenous Australians and homosexuality issues.

Discussion

This research attempted to demonstrate that attitudinal ambivalence does not necessitate the bivariate measurement of attitudes through the use of unfolding analysis, as well highlight that linear analyses cannot be used as evidence for a bivariate interpretation. Overall, the research hypotheses were predominantly supported, thus opening the door to future psychometric research into the unfolding analysis of attitude data. As expected, linear analyses were found to be consistent with past findings. Despite this, in accordance with the research prediction, the abortion and Indigenous Australians BEAMs were confirmed to adequately fit the HCM. The homosexuality BEAMs overall were not consistent with the model, however, a large proportion of the items from the subscales did display adequate fit. The scaling solutions, particularly for the Indigenous Australians BEAMs, were mostly consistent with the research hypotheses. Importantly, the ambivalent subscale items were found to be located toward the centre of the evaluative continuum. The items from the negative subscale were all closely positioned at a moderate location of their pole. The locations of the items from the positive subscale were all bunched at a more extreme region than expected. The implications of these findings include the empirical validation of the proposed bipolar conceptualisation as well as the strong endorsement of the use of unfolding model in attitude measurement.

A renewed conceptualisation of the bipolar evaluative continuum

Of greatest theoretical note is the empirical validation of the alternative conceptualisation of the bipolar attitude continuum which accounts for ambivalent

attitudes. Just as the abovementioned bipolar analogies possess a mixing of the polar elements at the centre of the continuum, there appears to be evidence that so to does the centre of the attitude continuum. Although such validation has been implicit in earlier unfolding research, this study's use of a measure developed out of the bivariate approach to demonstrate this is of particular significance. The BEAMs was specifically developed to minimise the participants' perceptions of the subscales as bipolar, and thus the overall bipolar solution obtained for two of the three attitude issues seems to be free of any confounding effect of this potential demand characteristic. It must be noted that 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 relation with dysphoric states. More simply, it could be the case that the descriptors in the ambivalence subscale are perceived by some participants as more mildly negative than ambivalent. This seems a reasonable speculation when one considers the valence of such items as 'tense', 'contradictory' or 'conflicted'. Hence, the precise relationship between ambivalence and the polar elements requires further investigation.

A potential 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. In fact, using the current methodology, a response pattern indicative of indifference would not be scalable using the HCM as presumably it would not include any endorsement of any of the subscale items. Whilst at face value this 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 continuum, 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. Thus, to attempt to locate such individuals on the evaluative continuum seems somewhat akin to the absurd situation of attempting to weigh on a balance scale something which has no weight (intended in the physical science's sense). Although the inability to find a sufficiently small standard weight to counterbalance the object may lead to the speculation that the object in fact has no weight, such a conclusion will always be ambiguous. If one wishes to measure a group of objects, some of which are suspected to possess no weight given their floating and rising actions (presuming the measurer has never encountered a balloon), then one would be best advised not simply to rely upon their balance scale. Rather, the weigher would include measures of other such factors as levels of air displacement. If you can demonstrate that, on top of the inability to find a sufficiently small counterbalancing weight, the object appears to displace very little or no air, then for all intensive purposes it may be treated as weightless.

Although the above example is somewhat comical, it parallels an argument made by the Social Judgment theorists for decades. This has been the assertion that individuals' attitudes cannot simply be represented as a single score or point on an evaluative continuum (Sherif, Sherif & Nebergall, 1965). They highlight the relevance of a number of other attitude parameters, in particular, what they term ego involvement or attitude

intensity. Ego involvement is defined as the personal importance of the attitude issue and one's evaluations of it. Akin to measures of air displacement in the balloon example, it is such a parameter which 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 this 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. The parameters identified by Social Judgment theory deserve far greater exploration in the attitude measurement literature.

Another criticism which may be levelled at this study's renewed bipolar conceptualisation is that its psychometric focus leads it to disregard a large proportion of the non-measurement based evidence cited in Cacioppo et al. (1997) which is argued to support the bivariate conceptualisation and measurement of attitudes. They cite a number of neurophysiological and experimental studies which appear to support the dissociation of the positive and negative evaluative processes underpinning attitudes. The lack of extensive review of such evidence in this paper is not a function of thematic blindsight, but rather it does not dispute the growing body of evidence for this dissociation. What it 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. It is this conscious endpoint which we are wishing to investigate in explicit attitude measurement, and the findings of this research appear to indicate that it should be treated as varying in a bipolar manner.

Abandoning the method of summated ratings

In addition, the current findings present further evidence that the ubiquitous method of summated ratings should be abandoned in attitude measurement for a number of reasons. Furthermore, it highlights the need for further research into the validity of the use of dominance IRT models in attitude assessment. The scaling solution of the positive and negative subscales of the BEAMs for each of the issues reveals a pattern typical of a measure developed under the traditional approach. 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. Most alarming is the mismatch of item locations to person locations across all three issues. The method of summated ratings and related dominance IRT models are reliant upon the vast majority of individuals' attitudes being either moderately positive or moderately negative toward the issue to provide accurate estimates of them. Whilst this may be found to be the case for most attitude issues, it is unclear why this should be assumed from the outset. Furthermore, even if the majority 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 at the extremes and toward the centre of the continuum when there is a viable alternative model which can account for all.

In this study, it has been demonstrated that unlike the method of summated ratings and related dominance models, the unfolding approach can account for ambivalent attitudes at the centre of the continuum 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 typically prohibited by the method of summated ratings and dominance 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. Unlike the dominance models, the unfolding model does not presume that an individual with a positive attitude will endorse all positive items. 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. Thus, the unfolding approach allows for the provision of stimuli which address the entire span of the attitude continuum including central, moderate and extreme locations. This provides the attitude researcher with more accurate estimates of individuals of all evaluative dispositions.

Conclusions

This study wholeheartedly rejects the assertion of Cacioppo and colleagues (1994; 1997; 1999) that attitude assessment must move beyond bipolar measures as such measures are inconsistent with attitudinal ambivalence. 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 empirically demonstrates that the linear analyses presumed by these theorists to support their bivariate standpoint are not valid, and that under an unfolding approach ambivalent attitudes are entirely consistent with a bipolar conceptualisation. Thus, it is argued that attitudinal ambivalence does not necessitate the abandonment of bipolar measures of attitudes. Rather, it requires the abandonment of the method of summated ratings in favour of unfolding analysis. These unfolding models promise more rigorous and objective measurements of persons of all attitudinal states.

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Appendix

Table 7.
Correlation matrix between the BEAMs positive and negative subscale items for the Indigenous Australians issue.

	Valence															
Valence	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-
+	-															
+	0.62	-														
+	0.57	0.51	-													
+	0.51	0.41	0.68	-												
+	0.49	0.47	0.61	0.67	-											
+	0.56	0.58	0.56	0.46	0.52	-										
+	0.49	0.58	0.49	0.44	0.49	0.57	-									
+	0.29	0.53	0.45	0.46	0.45	0.46	0.56	-								
-	-0.30	-0.23	-0.24	-0.31	-0.35	-0.29	-0.17	-0.12	-							
-	-0.37	-0.37	-0.46	-0.42	-0.47	-0.33	-0.16	-0.27	0.61	-						
-	-0.26	-0.31	-0.33	-0.40	-0.47	-0.28	-0.09	-0.25	0.56	0.76	-					
-	-0.01	-0.11	-0.07	-0.11	-0.23	-0.15	-0.14	-0.28	0.54	0.39	0.29	-				
-	-0.18	-0.13	-0.15	-0.27	-0.36	-0.10	-0.06	-0.10	0.59	0.54	0.58	0.38	-			
-	-0.28	-0.16	-0.33	-0.32	-0.38	-0.20	-0.04	-0.15	0.63	0.63	0.61	0.41	0.60	-		
-	-0.12	-0.20	-0.15	-0.27	-0.30	-0.14	-0.07	-0.17	0.56	0.48	0.57	0.34	0.47	0.56	-	
-	-0.16	-0.10	-0.25	-0.28	-0.21	-0.11	-0.05	-0.14	0.53	0.50	0.43	0.41	0.47	0.65	0.44	-

Table 8.
Correlation matrix between the BEAMs positive and negative subscale items for the Homosexuality issue.

	Valence															
Valence	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-
+	-															
+	0.53	-														
+	0.61	0.66	-													
+	0.44	0.48	0.63	-												
+	0.40	0.31	0.41	0.68	-											
+	0.59	0.57	0.71	0.60	0.49	-										
+	0.51	0.55	0.57	0.38	0.33	0.65	-									
+	0.50	0.36	0.55	0.60	0.56	0.49	0.42	-								
-	-0.35	-0.37	-0.35	-0.38	-0.45	-0.39	-0.19	-0.39	-							
-	-0.35	-0.25	-0.34	-0.38	-0.47	-0.34	-0.10	-0.40	0.64	-						
-	-0.29	-0.25	-0.35	-0.40	-0.46	-0.35	-0.15	-0.42	0.64	0.76	-					
-	-0.32	-0.17	-0.23	-0.34	-0.45	-0.30	-0.04	-0.31	0.60	0.63	0.57	-				
-	-0.30	-0.20	-0.25	-0.36	-0.46	-0.25	-0.02	-0.35	0.63	0.66	0.61	0.66	-			
-	-0.31	-0.25	-0.26	-0.30	-0.43	-0.32	-0.07	-0.34	0.70	0.78	0.69	0.71	0.69	-		
-	-0.35	-0.29	-0.36	-0.38	-0.50	-0.39	-0.18	-0.41	0.69	0.63	0.65	0.48	0.52	0.55	-	
-	-0.20	-0.21	-0.22	-0.23	-0.32	-0.27	-0.11	-0.34	0.62	0.48	0.45	0.50	0.47	0.57	0.46	-

Table 9.
Varimax factor loadings of the form B BEAMs positive, negative and ambivalent subscale items for the Indigenous Australians issue.

Item	Factor 1	Factor 2	Factor 3
Positive			
Desirable	-0.24	***0.72***	0.22
Positive	-0.09	***0.77***	-0.09
Likable	-0.24	***0.76***	0.03
Happy	-0.32	***0.70***	-0.01
Supporting	-0.35	***0.71***	-0.01
Good	-0.11	***0.77***	0.00
Attractive	0.14	***0.80***	-0.13
Satisfying	0.06	***0.70***	-0.31
Negative			
Unfavourable	***0.70***	-0.20	0.32
Unappealing	***0.74***	-0.35	0.17
Unpleasant	***0.79***	-0.26	0.09
Disagreeable	***0.30***	-0.12	0.65
Disapproving	***0.68***	-0.08	0.34
Punishing	***0.83***	-0.15	0.10
Distressed	***0.70***	-0.09	0.16
Uncomfortable	***0.64***	-0.07	0.33
Ambivalent			
Muddled	0.44	0.04	***0.50***
Jumbled	0.45	0.02	***0.51***
Tense	0.23	0.08	***0.69***
Conflicted	0.16	-0.02	***0.82***
Divided	0.08	-0.14	***0.75***
Contradictory	0.47	-0.08	***0.43***

* Eigenvalues were 7.57, 3.73 & 1.72. Factorial solution explained 59.18% of the overall variance.

Table 10.
Varimax factor loadings of the form A BEAMs positive, negative and ambivalent subscale items for the homosexuality issue.

Item	Factor 1	Factor 2	Factor 3
Positive			
Favourable	-0.26	***0.70***	0.04
Appealing	-0.10	***0.76***	-0.01
Pleasant	-0.15	***0.85***	-0.03
Agreeable	-0.28	***0.70***	-0.10
Approving	-0.44	***0.53***	-0.20
Rewarding	-0.18	***0.82***	-0.12
Delighted	0.08	***0.80***	0.08
Comfortable	-0.36	***0.64***	-0.02
Negative			
Undesirable	***0.73***	-0.30	0.26
Negative	***0.83***	-0.21	0.18
Unlikable	***0.75***	-0.26	0.23
Unhappy	***0.72***	-0.13	0.36
Opposing	***0.76***	-0.12	0.30
Bad	***0.85***	-0.15	0.19
Unattractive	***0.65***	-0.33	0.21
Unsatisfying	***0.60***	-0.16	0.24
Ambivalent			
Muddled	0.08	-0.22	***0.82***
Jumbled	0.14	-0.24	***0.82***
Tense	0.39	0.17	***0.66***
Conflicted	0.33	0.13	***0.73***
Divided	0.29	0.07	***0.57***
Contradictory	0.33	-0.02	***0.61***

* Eigenvalues were 8.66, 3.63 & 1.51. Factorial solution explained 62.76% of the overall variance.

Table 11.
Varimax factor loadings of the form A BEAMs positive and negative subscale items for the abortion issue.

Item	Factor 1	Factor 2
Positive		
Favourable	-0.29	**0.74**
Appealing	-0.24	**0.51**
Pleasant	-0.02	-0.04
Agreeable	-0.18	**0.82**
Approving	-0.29	**0.82**
Rewarding	-0.14	**0.51**
Delighted	-0.07	0.26
Comfortable	-0.23	0.41
Negative		
Undesirable	**0.71**	-0.23
Negative	**0.69**	-0.49
Unlikable	**0.74**	-0.48
Unhappy	**0.72**	-0.20
Opposing	**0.82**	-0.26
Bad	**0.79**	-0.41
Unattractive	**0.74**	-0.11
Unsatisfying	**0.76**	0.01

* Eigenvalues were 7.32, & 1.91. Factorial solution explained 57.71% of the overall variance.

Table 12.
Varimax factor loadings of the form B BEAMs positive and negative subscale items for the Indigenous Australians issue.

Item	Factor 1	Factor 2
Positive		
Favourable	-0.17	**0.76**
Appealing	-0.08	**0.77**
Pleasant	-0.22	**0.80**
Agreeable	-0.31	**0.73**
Approving	-0.36	**0.71**
Rewarding	-0.09	**0.76**
Delighted	0.09	**0.75**
Comfortable	-0.04	**0.63**
Negative		
Undesirable	**0.78**	-0.16
Negative	**0.76**	-0.36
Unlikable	**0.78**	-0.28
Unhappy	**0.50**	0.02
Opposing	**0.77**	-0.06
Bad	**0.84**	-0.14
Unattractive	**0.71**	-0.08
Unsatisfying	**0.72**	-0.05

* Eigenvalues were 6.52, & 2.94. Factorial solution explained 59.17% of the overall variance.

Table 13.
Varimax factor loadings of the form A BEAMs positive and negative subscale items for the homosexuality issue.

Item	Factor 1	Factor 2
Positive		
Favourable	-0.23	**0.72**
Appealing	-0.12	**0.75**
Pleasant	-0.17	**0.85**
Agreeable	-0.31	**0.70**
Approving	-0.49	**0.52**
Rewarding	-0.22	**0.82**
Delighted	0.08	**0.80**
Comfortable	-0.35	**0.64**
Negative		
Undesirable	**0.80**	-0.27
Negative	**0.84**	-0.20
Unlikable	**0.79**	-0.22
Unhappy	**0.79**	-0.12
Opposing	**0.81**	-0.11
Bad	**0.87**	-0.12
Unattractive	**0.71**	-0.29
Unsatisfying	**0.67**	-0.12

* Eigenvalues were 7.49, & 2.69. Factorial solution explained 63.57% of the overall variance.