Some insights into the reliability and validity of the Ayer Battery of Emotional Responses

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Abstract 'Emotion' plays an integral role in effective advertising and it is critically important for researchers to develop valid and reliable ways to measure consumers' emotional responses to advertising messages. The focus of this research was an examination of the reliability and validity of the N.W. Ayer Battery of Emotional Responses. Based upon four separate samples, the evidence consistently showed that the Ayer Battery was reliable and demonstrated both concurrent and predictive validity. The Ayer Battery is simple to use and may provide a measure that is accepted by both academic researchers and advertising practitioners.

INTRODUCTION

'Emotional kick' is an integral part of advertising effectiveness. As Zeitlin and Westwood¹ point out, 'No advertising communication can be neutral in its emotional content since then it would be communicating nothing at all'. The Rossiter and Percy model,² a commonly

used model of advertising, explicitly includes emotion as an integral component of effective advertising.

Interest in the role that emotion plays in advertising effectiveness can be traced back to the 1980s.³⁻⁵ During this time, researchers established linkages between affective responses and attitudes towards

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both the advertisement and the brand, as well as purchase intentions.^{6–15} This interest in emotions continues to this day.^{16,17} Indeed neuromarketing, the use of MRI technology in market research studies, is producing evidence to show that advertising messages and brand names produce an emotional response in consumers.^{18–20} Whether or not this neuromarketing technique can prove to be a cost-effective investigative tool remains to be seen.

Critical to all research efforts, of course, is the need to measure consumers' emotional responses to advertising. Many of the pencil and paper measures from previous studies have been reprinted in various editions of the 'Marketing Scales Handbook'.²¹ All of these scales/measures purport to measure some aspect of affect, though they vary in terms of what they measure and how wide their application is.

Unfortunately, with a few exceptions such as the BBDO picture-oriented test,²² most of the measures used in academic studies cannot be easily applied commercially. On the other hand, commercially derived measures are not usually available to academic researchers. One exception is the battery of emotional responses, developed at N.W. Ayer and reported by Kover and Abruzzo.²³ This scale has been used successfully in academic research^{24–26} and through these efforts has demonstrated its efficacy in differentiating the reactions of various groups to advertising messages.

The focus of this research effort is to assess further the reliability and validity of the N.W. Ayer Battery of Emotional Responses. This research examined the issues of concurrent validity, predictive validity and reliability utilising four separate samples, none of which were used in the development of the original scale. If the reliability and validity of the Ayer Battery can be established, it will

provide another measure of emotional responses to advertising, and one that is useful for both academic and commercial researchers.

ORIGINS OF THE AYER BATTERY OF EMOTIONAL RESPONSES

In much commercial advertising research the emotional impact of an advertisement is ignored. This is probably because of the difficulty of rapid and simple measurement of emotions. During the 1980s N.W. Ayer (then the oldest advertising agency in the USA) began the task of developing a simple measurement of emotional responses to advertising. The agency commissioned Rajeev Batra, then at Columbia University, to comb the existing psychological literature on emotion and mood and extract as many descriptions as possible.

This project resulted in the development of a long list of words and short phrases used in the literature to describe emotions, moods and states of feeling. Researchers at N.W. Ayer (primarily Joseph Abruzzo, Arthur Kover and Sidney Lister) then reduced this list in three ways: (1) eliminating redundancies; (2) eliminating a few descriptors that could not be easily understood; and (3) eliminating descriptors (ie terror, ecstasy) not normally elicited by advertising. The resulting list still contained more than 50 items. A nationally representative sample of consumers then rated each word/phrase as a response to a broad set of 45 television commercials. Based on these responses, the words/phrases were clustered through factor analysis into 16 factors. Each factor was then given a weight through regression with the dependent variable being purchase interest. Further testing involving two more samples resulted in a battery that the agency viewed as reliable and valid.

Table 1: N.W. Ayer Battery of Emotional Responses with Instructions

NOW, thinking just of this commercial. What emotions did this commercial arouse in you. Check as many or as few items as you think appropriate in Column A.			
	A		B
Aroused, playful	☐	Aroused, playful	☐
Embarrassed, guilty	☐	Embarrassed, guilty	☐
Benefited, enlighten	☐	Benefited, enlighten	☐
Affectionate, innocent	☐	Affectionate, innocent	☐
Attentive, not bored	☐	Attentive, not bored	☐
Virtuous, moral	☐	Virtuous, moral	☐
Tense, anxious	☐	Tense, anxious	☐
Amazed, astonished	☐	Amazed, astonished	☐
Disgusted, irritated	☐	Disgusted, irritated	☐
Confident, proud	☐	Confident, proud	☐
Suspicious, sceptical	☐	Suspicious, sceptical	☐
Angry, powerless, sad	☐	Angry, powerless, sad	☐
Wishful, hopeful, desirous	☐	Wishful, hopeful, desirous	☐
Sorrowful, afraid	☐	Sorrowful, afraid	☐
Serene, soothed	☐	Serene, soothed	☐
Confused, uninformed	☐	Confused, uninformed	☐
If you checked more than one set of emotions, please check in Column B the one set of emotions you felt most strongly.			

It should be noted that, during the Battery's development, agency personnel did not differentiate between moods and emotions. Agency researchers were not concerned with the academic distinction between mood and emotion; they only wanted to devise a battery that worked. It is also important to note that the Battery was heuristically derived and thus has ties to no particular theory. Details of its development were presented at a Marketing Science Institute Conference.²⁷ The final Battery is presented in Table 1.

METHODOLOGY

This current research effort utilised four very different samples to assess aspects of the reliability and validity of the Ayer Battery: (1) a traditional undergraduate student convenience sample from a suburban private Mid-Atlantic university; (2) a mature working student convenience sample from a small urban south-eastern state university; (3) a small but representative national sample of consumers; and (4) a stratified sample (large multinational shops and smaller

agencies) of advertising agency creative personnel representing 11 New York agencies. Details of these samples can be found in Table 2 and in the articles where they were originally used.²⁸⁻³⁰ Utilising such different groups of subjects not only allowed them to examine the robustness of the Battery, it also allowed the researchers to use samples that are commonly used by academic researchers (ie sample 1 and sample 2, college students) and samples that are commonly used by practitioners (ie sample 4, a national sample of consumers). This last sample, the consumers, was recruited by an independent research company (The Data Group) using a national random telephone sample. Selected participants were required to have a VCR unit in their home since they would be sent a VHS tape of the test commercials to view in their home and at their own pace.

A total of 15 commercials was tested among the samples. Each sample was exposed to six television commercials representing two product categories. The three commercials in each product

Table 2: Sample sizes and demographics

	Respondents	Average age	Percent male
Traditional undergraduate student sample	116	21.33	44.8
Mature working student sample	114	32.44	45.1
National consumer sample	69	38.40	44.1
Sample of New York advertising agencies' creative professionals	104	33.85	60.2

Table 3: Distribution of responses by sample for split half reliability using uniform random number generator

	Subsample 1	Subsample 2
Traditional undergraduate student sample	348	348
Mature working student sample	337	347
National consumer sample	188	226
Sample of New York advertising agencies' creative professionals	323	295

category consisted of: a commercial that had won a national award for creativity; a commercial that had won a national award for effectiveness; and a commercial judged to be average (neither great nor awful). Three commercials representing one product category (restaurants) were common across all four samples. The other three commercials represented another product category (either automobiles, sneakers or financial services) and varied for each sample.

Student samples and the agency sample watched the commercials in group settings. The consumer sample watched the commercials in their own homes at times of their choosing. After each exposure to a commercial, the subjects completed the Ayer Battery as well as indicating liking for the advertisement (five-point scale) and purchase interest (five-point scale). The Ayer Battery measures the presence or absence of each emotional response and then, as a relatively crude measure of intensity, which emotion was felt most strongly.

Each subject response was treated as if it were an independent observation. This approach is common among US advertising professionals although it may result in some bias since it treats all variation as if it were between

respondents when in fact some of the variation is truly within respondent. Analyses were also conducted separately for each sample and subsample so that any systematic bias due to the nature of the sample could be avoided.

ANALYSES

Concurrent validity

Concurrent validity has been defined as the extent to which one measure can be used to estimate an individual's score on a different measure of the same variable.³¹ Liking for an advertisement and the Ayer Battery are both measures of affect, thus concurrent validity was assessed by multiple regressions utilising liking for the advertisement as the dependent variable and the items of the Ayer Battery as the independent variables. Each individual item in the Ayer Battery was treated as a separate, independent variable and each was coded as zero (response not selected) or one (response selected).

Each of the four samples was randomly split into two subsamples (see Table 3). The first analyses used regression on each of the subsamples to assess how well the Ayer Battery

Table 4: Predictive ability (adjusted R squared) of Ayer Battery by subsample for liking the ad

	Subsample 1	Subsample 2
Traditional undergraduate student sample	0.52909	0.51657
Mature working student sample	0.57150	0.49418
National consumer sample	0.54758	0.54649
Sample of New York advertising agencies' creative professionals	0.68958	0.68146

Table 5: Correlations between actual liking for the ad and predicted liking for the ad based on split half coefficients by subsample

	Subsample 1	Subsample 2
Traditional undergraduate student sample	0.7163	0.6619
Mature working student sample	0.7706	0.6924
National consumer sample	0.7341	0.7053
Sample of New York advertising agencies' creative professionals	0.8183	0.8034

Table 6: Predictive ability (adjusted R squared) of Ayer Battery by subsample for purchase interest

	Subsample 1	Subsample 2
Traditional undergraduate student sample	0.45744	0.36846
Mature working student sample	0.46356	0.42249
National consumer sample	0.38181	0.42530
Sample of New York advertising agencies' creative professionals	0.50646	0.48993

predicted liking for the advertisement. As Table 4 shows, the adjusted variance explained for these eight regressions ranged from 49 per cent to 68 per cent. The regression coefficients derived from the Table 4 results were then applied to the other half of the split sample from the same sampling frame. These predicted values were correlated with actual values of liking for the advertisement (see Table 5) resulting in correlations that ranged from 0.66 to 0.81 (or variance explained ranging from 44 per cent to 66 per cent). Both of these sets of analyses resulted in reasonably high values across all eight subsamples and provide consistent support for concurrent validation of the Ayer Battery.

Predictive validity

Predictive validity has been defined as the extent to which an individual's score on a variable can be predicted by measuring his

or her performance (or score) on a related variable.³² The advertising industry accepts purchase interest is a reasonable proxy for purchase behaviour,³³ thus predictive validity could be assessed by examining the degree to which the Ayer Battery predicted purchase interest. Multiple regressions were again used to predict purchase interest from the items in the Ayer Battery.

The results of these regressions (shown in Table 6) indicate the adjusted variance explained ranged from 36 per cent to 50 per cent. As was done in the preceding analyses, these regression coefficients were applied to the other half of the split sample from the same sampling frame. These predicted values were then correlated with actual values of purchase interest (see Table 7) resulting in correlations that ranged from 0.57 to 0.71 (or variance explained ranging from 32 per cent to 50 per cent).

Both sets of analyses provide support for the predictive validity of the Ayer

Table 7: Correlations between actual purchase interest and predicted purchase interest based on split half coefficients by subsample

	Subsample 1	Subsample 2
Traditional undergraduate student sample	0.6627	0.5970
Mature working student sample	0.6566	0.6330
National consumer sample	0.6071	0.5750
Sample of New York advertising agencies' creative professionals	0.7103	0.6952

Table 8: Split half correlations of checked emotions by subsample

	Kendall's Tau	Pearson's R
Traditional undergraduate student sample	0.912 $p < 0.001$	0.970 $p < 0.001$
Mature working student sample	0.933 $p < 0.001$	0.984 $p < 0.001$
National consumer sample	0.862 $p < 0.001$	0.983 $p < 0.001$
Sample of New York advertising agencies' creative professionals	0.912 $p < 0.001$	0.994 $p < 0.001$

Table 9: Split half correlations of most strongly felt emotions by subsample

	Kendall's Tau	Pearson's R
Traditional undergraduate student sample	0.840 $p < 0.001$	0.971 $p < 0.001$
Mature working student sample	0.844 $p < 0.001$	0.985 $p < 0.001$
National consumer sample	0.828 $p < 0.001$	0.981 $p < 0.001$
Sample of New York advertising agencies creative professionals	0.826 $p < 0.001$	0.994 $p < 0.001$

Battery. It is worthwhile observing that in all subsample analyses the Ayer Battery is better able to predict liking for the brand than purchase interest. This is further confirmation of the Ayer Battery's validity since it measures reactions to an advertisement as does liking for an advertisement. Purchase interest on the other hand is further removed from these two measures since it is influenced by more than just the advertisement.

Reliability

The most common traditional approaches to reliability such as Cronbach's coefficient alpha and factor analytic/structural equation approaches are not applicable since, unlike a scale, the Battery's items are not summed for an overall score. Thus another approach to measuring consistency was identified. The frequency with which the individual emotional responses in the Ayer Battery

were selected was tabulated for each of the eight subsamples. These frequencies were then correlated across the subsamples within each sampling frame. The resulting correlations (Table 8) are very high with values of Kendall's Tau ranging from 0.862 to 0.933, and Pearson's r ranging from 0.970 to 0.994. This indicates a high level of consistency within the samples.

The Ayer Battery also asks respondents to indicate the emotion most strongly felt (a measure of intensity). Using the same approach to assess consistency, a count was made in each subsample of the frequency with which an individual emotional response in the Ayer Battery was selected as the emotional response most strongly felt. For each sampling frame the two frequency distributions were correlated (see Table 9). The values of Kendall's Tau ranged from 0.826 to 0.844 while the values for Pearson's r ranged from 0.97 to 0.99. These results

confirm the earlier conclusion of substantial consistency within each sample and provide substantial evidence of reliability of the Ayer Battery.

Consistency with the original N.W. Ayer study

As an additional assessment of the reliability of the Ayer Battery, the results of the present study were compared to some of the results of the original Ayer study. All four samples were combined and a regression predicting purchase interest based on the 16 items was conducted. The directionality of the coefficients (significant positive, not significant, significant negative) was determined and then compared to the directionality of the coefficients in the original Ayer study. Three quarters (12 out of 16) of the coefficients had the same directionality. When the coefficients of the items that differed are examined, three of the four items in the present study have coefficients that are not significant but are in the same direction as the coefficients in the original Ayer study. This seems to be reasonably consistent with the original Ayer Battery results since the present study is more than a decade later and based upon a much smaller number of television commercials.

In addition, the directionality of the most strongly felt emotion was classified (positively related to purchase interest = 1; negatively related to purchase interest = 0) using the original Ayer results. The small number of occasions (3 per cent) when the most strongly felt emotion was not related to purchase interest (based on the original Ayer) study were ignored. T-tests were then conducted to determine if the direction of the most strongly felt emotion was related to purchase interest. The t-tests were conducted for each

subsample and the results clearly show a significant relationship between these two variables (Table 10). When the most strongly felt emotion was positively related to purchase interest, mean purchase interest scores ranged from 3.01 to 3.47. When the most strongly felt emotion was negatively related to purchase interest, mean purchase interest scores ranged from 1.35 to 1.69. Strongly felt emotions that seemed to be related to purchase interest were, in fact, linked to differences in actual purchase interest. Once again there is evidence of the validity of the Ayer Battery.

CONCLUSIONS

The objective of this work was to examine the reliability and validity of the N.W. Ayer Battery of Emotional Responses. Testing the Battery with an independent set of samples is a first step toward making this important measurement tool more legitimate within the larger academic community. The evidence consistently shows that the Battery is reliable and demonstrates both concurrent and predictive validity. Another very positive finding was the lack of multicollinearity among the Ayer Battery items. The largest variance inflation factor was only 1.5, well below the danger level of 10.³⁴ This lack of multicollinearity indicates that the Ayer Battery retains its structure even after more than a decade.

As researchers strive to more fully understand the role that emotion plays in effective advertising, the Ayer Battery provides a simple, easy way to assess these emotional responses. Unlike the expensive scans utilised in neuromarketing, the pencil and paper tests developed by academic researchers but shunned by professionals, the Ayer Battery provides a simple measure that can be used in virtually any

Table 10: T-Tests of mean purchase interest based upon directionality (positive or negative) of the most strongly felt emotion

	Subsample 1	Subsample 2
Traditional undergraduate student sample		
Mean for positive emotions	3.11	3.01
Mean for negative emotions	1.63	1.69
	$t = 12.357, df = 286, p < 0.001$	$t = 10.634, df = 284, p < 0.001$
Mature working student sample		
Mean for positive emotions	3.44	3.47
Mean for negative emotions	1.52	1.62
	$t = 16.347, df = 278, p < 0.001$	$t = 15.084, df = 267, p < 0.001$
National consumer sample		
Mean for positive emotions	3.40	3.41
Mean for negative emotions	1.56	1.51
	$t = 11.680, df = 130, p < 0.001$	$t = 13.887, df = 159, p < 0.001$
Sample of New York advertising agencies' creative professionals		
Mean for positive emotions	3.29	3.13
Mean for negative emotions	1.36	1.35
	$t = 16.147, df = 307, p < 0.001$	$t = 14.716, df = 280, p < 0.001$

environment. It is an example of a free will gift from the normally closed world of business research. To the degree that it can find acceptance within both the academic community and among advertising professionals, the Ayer Battery may provide a way for these two groups to benefit from each other's research and narrow the divide between them.

Purists may cavil at the heuristic nature of the Ayer Battery and its mixing of emotion and mood. Yet, for the practitioners who have used it (and the academics who have written articles based on it) the Ayer Battery was robust and helpful. Furthermore, the Ayer Battery offers an interesting doorway to theory construction. In the development of the Ayer Battery, as with the early physical sciences, theory was formed to explicate common knowledge or everyday practice. The Battery seems to work; and is reliable and appears valid. Its development raises the question, 'how can theory be formed using this heuristic?'. In addition, the Ayer Battery offers an interesting doorway to theory construction. (In our new scientific

language, 'heuristic' may be a synonym for folk knowledge.) Why, for instance, must mood and emotion be separated? What is the implicit chain of moods and feelings contained in this Battery? Perhaps the greatest benefit of the Ayer Battery is to open questions about the formation of theory and the application of practice to theory (and not the other way around). Studying the accepted, everyday practices of advertising professionals and drawing from this knowledge may open the way for social scientists to develop new theories to explain how advertising affects consumers and the decisions they make.

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