University of Wollongong
Research Online

Faculty of Commerce - Papers (Archive)

Faculty of Business

2004

Predicting the effectiveness of anti-speeding TV advertisements by skin conductance response (SCR)

Jennifer Thornton
University of Wollongong, jennifer_thornton@uow.edu.au

John R. Rossiter
University of Wollongong, john_rossiter@uow.edu.au

Publication Details

Algie, J. & Rossiter, J. R. (2004). Predicting the effectiveness of anti-speeding TV advertisements by skin conductance response (SCR). Proceedings of the Australian and New Zealand Marketing Academy Conference (pp. 1-7). Wellington, New Zealand: Austalian and New Zealand Marketing Academy.

Research Online is the open access institutional repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au

Predicting the effectiveness of anti-speeding TV advertisements by skin conductance response (SCR)

Abstract

The purpose of this study is to determine whether the Hopkins and Fletcher (1994) ad-testing measure - which uses skin conductance response (SCR) to predict the effectiveness of sales messages for commercial products and services - would be similarly predictive for road safety ads. The predictive ability of SCR was tested on four pairs of anti-speeding ads using a behavioural dependent measure of speed choice. Overall, there was a weak correlation between SCR scores and speed choice scores ($r = -.116$, $p < .10$), and this was largely due to a strong correlation for one of the eight ads tested Further analysis showed that out of 16 possible comparisons of SCR scores and speed choice scores, by gender and ad, only two were found to be significantly correlated in the hypothesised direction. The Hopkins and Fletcher SCR ad-testing measure is not a dependable predictor of the effectiveness of antispeeding ads.

Keywords

response, conductance, skin, scr, advertisements, predicting, tv, speeding, anti, effectiveness

Disciplines

Business | Social and Behavioral Sciences

Publication Details

Algie, J. & Rossiter, J. R. (2004). Predicting the effectiveness of anti-speeding TV advertisements by skin conductance response (SCR). Proceedings of the Australian and New Zealand Marketing Academy Conference (pp. 1-7). Wellington, New Zealand: Austalian and New Zealand Marketing Academy.

This conference paper is available at Research Online: http://ro.uow.edu.au/commpapers/2888

Predicting the Effectiveness of Anti-Speeding TV Advertisements by Skin Conductance Response (SCR)

Jennifer Thornton and John R. Rossiter
School of Management and Marketing, University of Wollongong

Abstract

The purpose of this study is to determine whether the Hopkins and Fletcher (1994) ad-testing measure – which uses skin conductance response (SCR) to predict the effectiveness of sales messages for commercial products and services – would be similarly predictive for road safety ads. The predictive ability of SCR was tested on four pairs of anti-speeding ads using a behavioural dependent measure of speed choice. Overall, there was a weak correlation between SCR scores and speed choice scores ($r = -.116$, $p < .10$), and this was largely due to a strong correlation for one of the eight ads tested. Further analysis showed that out of 16 possible comparisons of SCR scores and speed choice scores, by gender and ad, only two were found to be significantly correlated in the hypothesised direction. The Hopkins and Fletcher SCR ad-testing measure is not a dependable predictor of the effectiveness of anti-speeding ads.

Keywords: social marketing; anti-speeding advertising; skin conductance response

Introduction

Fear appeals are commonly used in social marketing campaigns. The use of fear is considered by many advertisers as necessary to motivate and persuade people to undertake an activity they may not see the immediate benefit of or an activity of greater good to the community than to self-interest. It is known that "individuals may differ significantly in the level of emotional intensity with which they respond to an advertising stimulus" (Morree and Harris, 1996, p. 38). Measurement of differences in levels of emotional intensity among participants in marketing studies, particularly advertising experiments, has generally been limited to static, post-exposure reports (Vanden Abeele and MacLachlan, 1994) of various emotions. Electrodermal Response (EDR) Measurement, in the form of skin conductance response (SCR), is an alternative method to determine emotional reactions (such as fear) to threat appeal ads.

Previous research by Thornton and Rossiter (2003) has established two distinct types of fear patterns within anti-speeding advertisements – *fear-relief* and *rising fear,* using a continuous response measurement dial. The relative effectiveness of these fear patterns is further tested in this study by using the more technical ad-testing method of psychophysiological recording. Hopkins and Fletcher (1994) propose that ads with higher SCR scores will achieve better sales results. Hence, it is assumed for this study that anti-speeding ads with higher SCR scores should produce better (that is, lower) speed-choice scores, thus a negative correlation between the SCR score and AVST score is expected.

Psychophysiological measurements

Also known as Galvanic Skin Response (GSR) or Electrodermal Response (EDR), SCR records involuntary changes in the electrical activity of the skin, which is measured by the change in skin resistance. Skin conductance *response* (also abbreviated SCR) refers to phasic data (short-term, that is, only a few seconds), which are fluctuations in electrical conductivity of the skin from a base level, while skin conductance *level* (SCL) refers to tonic data, which are longer-term averages of reactions to stimuli lasting a minimum of 30 seconds (Andreassi, 2000; Hopkins and Fletcher, 1994). Examples of SCR and SCL are provided in Figures 1 and 2.

Figure 1 –SCR for Participant No. 6

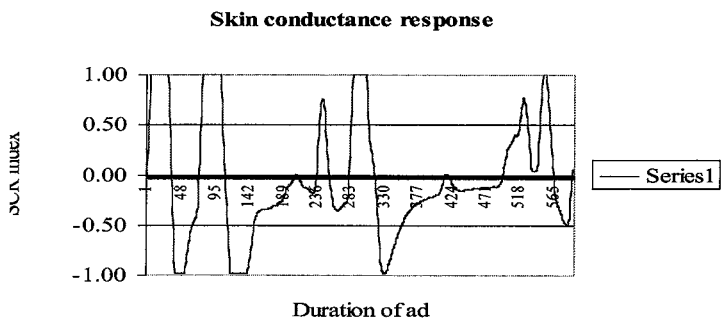
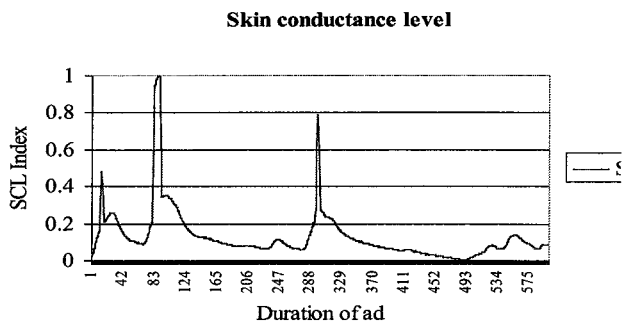


Figure 2 – SCL for Participant No. 6



Krober-Riel (1979) supports the use of SCR (skin conductance *response* specifically) and notes that it is one of the most frequently applied activation indices and discusses previous studies by Lykken and Venables (1971), Burstein, Frenz, Bergeron and Epstein (1965) and McCurdy (1950) that have demonstrated the validity and reliability of SCR. Kilbourne, Painton, and Ridley (1985) used SCR to determine differences in participants' reactions to different versions of subliminally embedded sexual images in advertising. A more recent study by Collet, Vernet-Maury, Delhomme, and Dittmar (1997) used SCR to test the specificity of autonomic nervous system responses to emotional stimuli, and found the measure to be accurate.

Kohan (1968) stated that psychophysiological responses show less bias than verbal responses. Similarly, Rogers (1983, p.164) indicated that "people don't possess the appropriate language to report bodily states and...people may be unwilling to report truthfully". The ad likability and effectiveness of many television ads are normally tested using self-report measures. Vaughan (1980) is yet another author who proposed that psychophysiological tests would be more helpful to measure attitude shift and emotional arousal when testing the effect of advertising. Similarly, Baggozi, Gopinath, and Nyer (1999) support the use of multiple measures, particularly psychophysiological responses, to measure emotions, arguing that "arousal is a key part of emotional functions in the brain that underlies much of its automaticity" (p. 193).

Mewborn and Rogers' (1979) study is one of the few experiments that have used both self-reports of fear and a psychophysiological (SCR) measure of emotion to investigate the effect

of fear appeals. The justification given for using an SCR measure of fear was that an essential part of the definition of emotion is physiological reactions. For example, Schaever, Schwartz, Kirson and O'Connor (1987, p.1076) describe a person's state when they feel fearful as being an arousal of the autonomic nervous system in preparation for fright, "the person feels jittery and jumpy, perspires, trembles and looks quickly around". Mewborn and Rogers' (1979) study had a similar purpose to the present study. However the stimulus used was a 6-minute film showing sexually transmitted diseases (STDs) such as syphilis. A lengthy film differs significantly from the shorter (30-60 second) road safety advertisements used as stimuli in the present study. Mewborn and Rogers' (1979) found that the high-fear film produced higher skin conductance, and that the reassurance message (relief) produced stronger intentions to seek screening for STDs than the low reassurance message (no relief). Behavioural measures were not obtained. Path analysis was used and "the only significant finding was a path coefficient of .42 between self-reported reassurance and the intention items. Neither the autonomic nor self-reported measures of fear predicted attitudes [or intention]" (Mewborn and Rogers,1979, p. 251). However, this study did not use the Hopkins and Fletcher (1994) formula, as it was not available at that time.

Hopkins and Fletcher's SCR Formula

Skin *conductance* is the opposite to skin *resistance*, which was initially reported upon on in the early years of psychophysiological recording, hence skin conductance responses (SCR) are calculated by deducting the average baseline figure (pre-response *reciprocal*) from the responses during the ad (response *reciprocal*). The amplitude measure (SCR) reflects the deviation of responses from a base level. The calculation for determining the SCR scores to use in the Hopkins and Fletcher formula is as follows: *first*, deduct the 2-minute baseline average of SCR from each during-ad skin conductance response (SCR_x); *second*, find the maximum (SCR_{max}) of these values, that is, the largest amplitude of change from the pre-response level; and *third*, calculate the SCR adjusted score (SCR_{adj}). The SCR-adjusted score, the score used in the formula, is calculated by dividing each SCR value by the SCR maximum score ($SCR_{adj} = SCR_x / SCR_{max}$). Hopkins and Fletcher constructed the following formula for a 30-second TV commercial:

$$\text{SCR Score} = \frac{\text{Initial} + 2*S1 + 2*S2 + \text{Tonic measure}}{6}$$

The variables in the formula are: Initial = largest peak in first 2.5 seconds; Salient 1 (S1) = largest peak in 2.51-15secs; Salient 2 (S2) = largest peak in 15.01-27.5 seconds and;Tonic measure = a measure of sustained response, which is calculated by taking the average of all maximum SCR values for each 2.5 second interval other than the Salient and Initial values (LaBarbera and Tucciarone, 1995).

Research Objective and Methodology

The main purpose of the present study was to determine whether the Hopkins and Fletcher SCR formula could predict the effectiveness of anti-speeding television commercials (using the dependent variable of speed choice).

An advertising experiment was conducted to test the effectiveness of two types of underlying "patterns" of fear arousal - *fear-relief* and *rising fear*. Four original anti-speeding commercials had paired counterparts constructed to control for variations in ad content. This provided a set of eight ads consisting of 4 *fear-relief* ads and 4 *rising fear* ads. Participants for the study were recruited via mall-intercept. As an estimate, at least four out of ten people approached agreed to take part for an incentive of Movie Money ($13). A pre-questionnaire was used to obtain driving behaviour and demographics. The advertising experiment involved 160 participants (plus a control group of 27 participants) aged 18-25 years old. Each participant watched only one of the eight advertisements. Eight experimental groups (n=20 per group) were used to test the ads with quotas being set to evenly distribute participants by gender (10 males and 10 females) and previous speeding behaviour (5 non-speeders and 5 speeders per gender group). The control group watched an unrelated TV advertisement.

The SCR recording device was UFI's Model 2701-SC Simple Scope [August 2001 version]. Participants had consented to have finger-cuff electrodes fitted to their middle and index fingers. Participants were then instructed to sit comfortably and quietly while they watched a black television screen with a white cross (+) on it for 3 minutes. The ad then immediately followed this 3-minute baseline period.

The Australian Video Speed Test (AVST) was used as the quasi-behavioural dependent variable in the study (Thornton and Rossiter, 2003). In the AVST participants watch a video of 11 driving scenarios (1 practice scene and 10 test scenes) and respond by stating how much faster or slower (if at all) they would drive in the same situation. The 10 test scenes are averaged to form the AVST score.

Results

Hopkins and Fletcher's SCR scores for commercial ads range from 0 to 0.500 (Hopkins and Fletcher 1994), with a high test score being greater than 0.270. All the anti-speeding ads performed well on this measure, compared to commercial ads (see third column in Table 1).

Overall, across all 8 ads, the SCR scores were weakly correlated with the AVST scores ($r = -.116$, $p < .10$). The *fear-relief* ads had a correlation of $-.145$ ($p < .10$), and the *rising fear* ads had a correlation of $-.077$ (n.s). However the significant results were largely due to the SCR and AVST correlation for the 4WD-Relief ad, (Kendall's $\tau = -.284$, $p < .05$).

Previous studies of arousal have found that males produced higher SCR than females (Greenwald, Cook and Lang 1989; Lang, Greenwald, Bradley and Hamm 1993). This difference was observed in the present study, where the average SCL for males was 15.5 and the average SCL for females equal to 13.0 ($F = 6.28$, $p < .05$). Therefore an analysis of the correlations by gender was undertaken (see Table 1, last two columns). There was a high positive correlation between SCR scores and the AVST for females for the Pram-Relief ad ($\tau = .523$, $p < .05$), meaning the higher the SCR score, the higher the speed score, yet the Pram-

Fear ad produced a non-significant correlation ($\tau = -.140$, *n.s*). For males, the SCR and AVST scores for the 4WD-Fear had a negative correlation ($\tau = -.395$, $p < .10$), yet had a positive correlation for the Pram-Fear ad ($\tau = .378$, $p < .10$). In total, however, only two of the 16 correlations were significant in the right (predictive) direction.

Table 1- Comparison of SCR and AVST scores

Ad	n	SCR-score	Difference from control ad speed in km/hr	Correlation of SCR and AVST (Kendall's τ)	Gender	
					Female	Male
Pizza-Relief	22	0.394	–2.55	.079	.130	.154
Pizza-Fear	18	0.390	–1.48	.082	.071	.190
Trike-Relief	22	0.430	–2.17	–.158	–.182	–.281
Trike-Fear	22	0.356	–1.70	.066	.067	.248
Pram-Relief	20	0.392	–1.47	.119	.523**	–.099
Pram-Fear	22	0.371	–0.80	–.039	–.140	.378*
4WD-Relief	20	0.401	–2.59	–.284**	–.400*	.030
4WD-Fear	19	0.396	–1.47	–.102	.203	–.395*

* $p < .10$
** $p < .05$

Conclusion

This application of Hopkins and Fletcher's SCR ad-testing measure to anti-speeding ads has determined that the SCR score is not a dependable predictor of ad effectiveness. The predictive ability of SCR in identifying ads that will make drivers slow down is questionable, given that out of 16 possible comparisons of SCR scores and speed choice scores, by gender and ad, only two were found to be significantly correlated in the hypothesised direction.

It is possible that the SCR formula does not work for ads that generate high fear, which all the present ads did. Hopkins and Fletcher's SCR measure was validated on ads for commercial products and services that either would not use fear, or would involve only a moderate level of fear (e.g., ads for home or life insurance). The present findings do not invalidate their SCR formula in general but rather suggest its predictive validity may be restricted for testing road safety ads.

References

Andreassi, J. L., 2000. Psychophysiology: Human Behavior and Physiological Response, fourth edition. Mahwah: Lawrence Erlbaum Associates.

Bagozzi, R. P., 1991. The Role of Psychophysiology in Consumer Research. 124-161. In Robertson, T.S., and Kassarjian, H.H. (Eds.). Handbook of Consumer Behavior. Englewood Cliffs: Prentice-Hall.

Bagozzi, R., Gopinath, M., and Nyer, P. U.,1999. The Role of Emotions in Marketing. Journal of Academy of Marketing Science, 27(2), 184-206.

Burstein, K., Frenz, W., Bergeron, J., and Epstein, S., 1965. A Comparison of Skin Potential and Skin Resistance Responses as Measures of Emotional Responsivity. Psychophysiology. 2,14-25.

Collet, C., Vernet-Maury, E., Delhomme, G., and Dittmar, A., 1997. Autonomic Nervous System Response Patterns Specificity to Basic Emotions. Journal of the Autonomic Nervous System. 62 (1), 45-58.

Hopkins, R., and Fletcher, J., 1994. Electrodermal Measurement Particularly Effective for Forecasting Message Influence on sales Appeal. In Lang, A. (Ed.). Measuring Psychological Responses to Media, Hillsdale: Lawrence Erlbaum Associates, 113-132.

Kilbourne, W. E., Painton, S., and Ridley, D., 1985. The Effect of Sexual Embedding on Responses to Magazine Advertisements. Journal of Advertising. 14(2), 48-55.

Kohan, X., 1968. A Physiological Measure of Commercial Effectiveness. Journal of Advertising. 8(4), 46-48.

Kroeber-Riel, W., 1979. Activation Research: Psychobiological Approaches in Consumer Research. Journal of Consumer Research. 5 (4), 240-250.

Greenwald, M .K., Cook, E. W., and Lang, P. J., 1989. Affective Judgement and Psychophyioslogical Response: Dimensional Covariation in the Evaluation of Pictorial Stimuli. Journal of Psychophysiology. 3, 51-64.

LaBarbera, P. A, and Tucciarone, J. D., 1995. GSR Reconsidered: A Behavior-Based Approach to Evaluating and Improving The Sales Potency of Advertising. Journal of Advertising Research. 35(5), 33-54.

Lykken, D. T., and Venables, P. H., 1971. Direct Measurement of Skin Conductance: A Proposal for Standardisation, Psychophysiology. 8, 656-672.

Lang, P. J., Greenwald, M .K., Bradley, M. M., and Hamm, A. O., 1993. Looking at Pictures: Affective, Facial, Visceral, and Behavioral Reactions. Psychophysiology. 30, 261-273.

McCurdy, H., 1950. Consciousness and the Galvonometer. Psychological Review. 57, 322-327.

Mewborn, C. R., and Rogers, R. W., 1979. Effects of Threatening and Reassuring Components of Fear Appeals on Physiological and Verbal Measures of Emotion and Attitudes. Journal of Experimental Social Psychology. (15), 242-253.

Rogers, R. W., 1983., Cognitive and Physiological Processes in Fear Appeals and Attitude Change: A Revised Theory of Protection Motivation. In Cacioppo, J., and Petty, R. (Eds.). Social Psychophysiology, New York, Guildford Press, 153-176.

Shaver, P., Schwartz, J., Kirson, D., and O'Connor, C., 1987. Emotion Knowledge: Further Exploration of a Prototype Approach. Journal of Personality and Social Psychology. 52(6), 1061-1086.

Thornton, J., and Rossiter, J. R., 2003. Fear Patterning in Anti-Speeding TV Advertisements. In (Ed.). In Saren, M., and Wilson, A. (Eds.). Proceedings of the European Marketing Academy Conference, Glasgow, University of Strathclyde.

Thornton, J., and Rossiter, J. R., 2003. Development and Validation of an Australian Video Speed Test (AVST), In Proceedings of the 2003 Road Safety Research, Policing and Education Conference, Sydney, Roads and Traffic Authority.

Vanden Abeele, P., and MacLachlan, D. L., 1994. Process Tracing of Emotional Responses to TV Ads: Revisiting the Warmth Monitor. Journal of Consumer Research. 20, 586-600.

Vaughn, R., 1980. How Advertising Works: A Planning Model. Journal of Advertising Research. 20(5), 27-35.