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The Role of Green Advertising in Influencing Consumer Behavior: A Meta-Analysis of Empirical Studies

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This meta-analysis examines the influence of green advertising on consumer behavior by synthesizing findings from 50 empirical studies published between 2010-2023. Green advertising, which promotes the environmental benefits of products, has become increasingly prevalent as companies aim to appeal to environmentally-conscious consumers. However, the effectiveness of green advertising in actually shifting consumer purchasing behavior remains debated. By quantitatively aggregating results across studies using different methodologies, samples and green ad types, this meta-analysis assesses the overall impact of green advertising. Effect sizes capturing green advertising's influence on key consumer behavior outcomes, including attitudes, purchase intentions and actual purchasing, were extracted from each study. Random-effects meta-analytic models were used to compute weighted mean effect sizes. Results reveal green advertising has a significant positive effect on all consumer behavior outcomes, with the largest effects on attitudes and the smallest on actual purchasing. Several factors moderated these effects, with green ads focused on environmentally-friendly packaging and environmental impact having the greatest influence. Effects were also stronger for high-involvement green products and younger and female consumers. Findings from this comprehensive meta-analysis highlight green advertising's capacity to drive more environmentally-sustainable consumer behavior, while identifying approaches for optimizing green ads' effectiveness. Implications for green marketing theory and practice are discussed.

Keywords: Green advertising; consumer behavior; environmental sustainability; meta-analysis.

1. Introduction

As environmental sustainability has taken on greater societal importance, green advertising has proliferated as a marketing strategy. Green advertising involves promotional messages highlighting the environmentally-friendly attributes or environmental benefits of products/services [1]. Companies employ green advertising to capitalize on growing environmental concern among consumers and incentivize more sustainable consumption patterns [2,3].

Compared to traditional advertising focusing on product functional benefits, green ads aim to boost a brand's eco-friendly image and appeal to consumers' environmental values [4]. Common green advertising appeals include emphasizing natural or organic ingredients,

biodegradable or recyclable packaging, a product's energy efficiency, or a company's sustainable manufacturing practices and environmental charity support [5].

While surveys consistently show high environmental concern and strong preferences for green products among consumers, intention-behavior gaps persist, with actual purchases of green alternatives often lagging behind expressed intentions [6,7]. This value-action gap raises important questions regarding the ability of green advertising to translate pro-environmental attitudes into actual green purchasing [8].

Numerous empirical studies have examined green advertising's influence on various facets of consumer behavior, from shaping environmental attitudes, to intentions to buy green products, to actual green purchasing. However, this research spans disparate methodologies (e.g. experiments, surveys, and econometric analyses), green ad characteristics (e.g. executional elements, product types, and green appeals) and consumer behavior outcomes. Narrative literature reviews provide useful summaries of findings but do not quantify effects [9].

Meta-analysis, in contrast, allows for quantitative synthesis of empirical results across studies, controlling for sampling and measurement error [10]. By converting study results to standardized effect sizes and combining them using a common metric, meta-analysis determines the overall magnitude of a relationship and the role of potential moderators [11].

Two prior meta-analyses have included green advertising, but only as part of broader syntheses of predictors of green purchasing [12] and consequences of environmental concern [13]. While both found green advertising had a significant positive effect, neither comprehensively examined the green advertising literature nor explored the role of underlying ad, product or consumer characteristics as moderators.

The present meta-analysis aims to provide a more focused and nuanced assessment of green advertising's impact by synthesizing empirical results from the full scope of independent studies specifically examining its effects on consumer behavior. The meta-analysis has three primary objectives:

1. Quantify the overall relationship between green advertising and key consumer behavior outcomes (attitudes, purchase intentions, actual purchasing)

2. Determine how this relationship varies across different outcome types

3. Identify green ad, product and consumer characteristics that moderate the strength of the relationship

Findings will yield an enhanced understanding of when and how green advertising is most effective in encouraging sustainable consumer behavior. Aggregating results across the empirical literature will provide more conclusive evidence than any single study for green advertising's potential to drive green purchases. Assessing the relative impact on attitudes vs. intentions vs. behavior will also help gauge green advertising's capacity to bridge environmental intention-behavior gaps. Examining moderators will identify strategies for optimizing green ads' effectiveness.

These insights will inform ongoing theoretical debates regarding the drivers of pro-environmental consumer behavior and the efficacy of marketing interventions for promoting sustainability [14,15]. Practical implications for how companies, non-profits and policymakers

can harness green advertising to foster environmentally-responsible consumption will also be discussed [16]. Overall, this meta-analysis will synthesize current knowledge on green advertising as a tool for motivating eco-friendly consumer behavior, while highlighting avenues for future research.

2. MATERIALS AND METHODS

2.1 LITERATURE SEARCH AND INCLUSION CRITERIA

A comprehensive literature search was conducted to identify all relevant empirical studies examining green advertising's influence on consumer behavior. The search utilized four databases: Business Source Complete, PsychINFO, Communication & Mass Media Complete and ProQuest Dissertations & Theses. Search terms included: ("green advertising" OR "environmental advertising" OR "eco-friendly advertising") AND ("consumer behavior" OR "consumer attitudes" OR "purchase intentions" OR "green purchasing"). The reference lists of obtained articles were also reviewed to find additional studies.

To be included in the meta-analysis, a study had to meet the following criteria:

1. Included at least one quantitative analysis examining the relationship between exposure to green advertising and a measure of consumer attitudes, purchase intentions and/or actual purchasing behavior

2. Focused on product-level green advertising (as opposed to corporate-level environmental messages)

3. Used primary consumer data collected from real-world or student samples (not secondary data or modeling)

4. Contained necessary statistical information to calculate effect sizes (e.g. correlations, standardized regression coefficients, t-values, means and standard deviations)

5. Was written in English and published between January 2010 and March 2023 (to ensure current relevance given rapid changes in sustainable consumption trends)

The initial literature search generated 635 potentially relevant articles. After removal of duplicates and screening of titles and abstracts, 158 articles were retained for full-text review. Of these, 50 articles met the inclusion criteria and were included in the final meta-analysis. The most common reasons for exclusion were a lack of quantitative consumer behavior outcome data (n=48), inadequate effect size information (n=36) and focusing on corporate rather than product-level green advertising (n=24).

2.2 CODING OF STUDIES

Each study was coded for relevant variables, including:

1. Sample characteristics: country, mean age, gender composition (% female), student vs. general population

2. Green advertisement characteristics: ad medium (e.g. print, TV, online), green appeal type (general vs. specific environmental claims), executional framework (informational vs. emotional)

3. Product characteristics: product type, level of consumer involvement (high vs. low)

4. Consumer behavior outcomes: attitudes, purchase intentions, actual purchase behavior

5. Effect size data: correlations, regression coefficients, means, standard deviations, sample sizes

The coding process was completed by two independent raters. Inter-rater agreement was high, with Cohen's kappa exceeding 0.80 for all categorical variables and correlations above 0.90 for continuous variables. Disagreements were resolved through discussion.

2.3 EFFECT SIZE CALCULATION AND ANALYSIS

The Pearson correlation coefficient r was used as the common effect size metric, as it was the most frequently reported statistic across studies. For studies not directly reporting correlations, other available statistics (e.g. standardized regression coefficients, t-tests, means and standard deviations) were converted to r values using formulas from Lipsey and Wilson [10]. Effect sizes were coded such that positive values indicated green advertising increased pro-environmental consumer attitudes or behaviors. Correlation coefficients were converted to Fisher's z scale before meta-analysis and back-transformed to r for interpretation.

Random-effects meta-analytic models were used to calculate sample-weighted mean effect sizes, given the expected heterogeneity in study effects due to differences in ad stimuli, measures and methodologies [11]. Separate mean effect sizes were computed for each consumer behavior outcome. The Q and I^2 statistics were used to assess effect size heterogeneity. Moderator analyses using meta-regression examined whether effect sizes differed based on ad, product or consumer characteristics.

Publication bias was assessed using funnel plots and Egger's regression test [17]. If asymmetry was detected, the trim-and-fill method was applied to estimate effect sizes adjusted for potential missing studies [18].

3. RESULTS

3.1 CHARACTERISTICS OF INCLUDED STUDIES

The 50 studies included in the meta-analysis contained a total of 20,568 consumers. Key characteristics of the studies are summarized in Table 1. The majority (68%) used experimental designs manipulating exposure to green vs. non-green or no advertising. The remaining studies used surveys measuring green ad exposure and consumer behavior variables.

Most studies focused on green print or digital advertising, with only 8% examining TV ads. Environmental sustainability was the most commonly promoted product benefit, featured in 76% of ads. Nearly a quarter highlighted more specific green claims like organic ingredients or recyclable packaging.

Studies spanned a range of product categories, with food/beverages (28%), personal care products (22%) and household cleaning supplies (18%) being most prevalent. High involvement products made up a larger proportion of the sample compared to low involvement products (64% vs. 36%).

In terms of consumer behavior outcomes, green ad effects on attitudes were examined most frequently (92% of studies), followed by purchase intentions (74%) and actual purchase behavior (22%). Average scores indicated generally positive attitudes and intentions in response to green ads, while actual purchases had more modest mean values (Table 2).

TABLE 1. CHARACTERISTICS OF INCLUDED STUDIES (K = 50)

Study Characteristic	Frequency (%)
Sample Characteristics	
Country	
United States	19 (38%)
China	9 (18%)
United Kingdom	6 (12%)
Other European Countries	12 (24%)
Other Asian Countries	4 (8%)
Mean Age	28.5 (SD = 6.2)
Gender (% Female)	56.8% (SD = 12.3%)
Student Sample	17 (34%)
Green Advertisement Characteristics	
Medium Print	22 (44%)
Digital	20 (40%)
Television	4 (8%)
Multiple Media	4 (8%)
Environmental Appeal	
General Sustainability	38 (76%)
Organic/Natural Ingredients	6 (12%)
Recyclable/Biodegradable Packaging	4 (8%)
Energy Efficiency	2 (4%)
Executional Framework	
Informational	32 (64%)
Emotional	12 (24%)
Combined	6 (12%)
Product Characteristics	
Product Type	
Food and Beverages	14 (28%)
Personal Care	11 (22%)
Household Cleaning Supplies	9 (18%)
Electronics	5 (10%)
Apparel	4 (8%)
Other	7 (14%)
Level of Involvement	
High	32 (64%)
Low	18 (36%)
Consumer Behavior Outcomes	
Attitudes	46 (92%)
Purchase Intentions	37 (74%)
Actual Purchase Behavior	11 (22%)

TABLE 2. DESCRIPTIVE STATISTICS FOR CONSUMER BEHAVIOR VARIABLES

Variable	k	M	SD	Min	Max
Attitudes	46	5.38	1.09	3.25	7.00
Purchase Intentions	37	4.92	1.26	2.50	6.80
Actual Purchase Behavior	11	0.18	0.11	0.05	0.36

Note: Attitudes and intentions measured on 1-7 scales. Actual purchase behavior captures proportion of product purchases that were green.

3.2 OVERALL EFFECT OF GREEN ADVERTISING ON CONSUMER BEHAVIOR

Table 3 presents the meta-analytic results for the overall effect of green advertising on consumer behavior. Across all 50 studies, the random effects mean correlation between green advertising and consumer behavior outcomes was r = .316 (95% CI: .258, .371, p < .001). The significant Q statistic (Q(49) = 642.54, p < .001) and high I^2 value (92.38%) indicated substantial heterogeneity in effect sizes across studies.

TABLE 3. META-ANALYSIS RESULTS: OVERALL EFFECT OF GREEN ADVERTISING ON CONSUMER BEHAVIOR

Consumer Behavior Outcome	k	N	Mean r	95% CI	Q	I2
All	50	20,568	.316***	[.258, .371]	642.54***	92.38%
Attitudes	46	17,352	.384***	[.325, .440]	552.77***	91.86%
Purchase Intentions	37	14,811	.273***	[.209, .335]	399.62***	91.00%
Actual Purchase Behavior	11	3,826	.141**	[.052, .228]	58.13***	82.79%

Note: ** p < .01, *** p < .001

Differentiating by outcome type, green advertising had significant positive effects on all three consumer behavior variables, but effect sizes varied in strength. Green advertising had the largest impact on attitudes (r = .384, 95% CI: .325, .440, p < .001), followed by purchase intentions (r = .273, 95% CI: .209, .335, p < .001). The effect was smallest, but still significant, for actual purchase behavior (r = .141, 95% CI: .052, .228, p < .01). All three outcome types exhibited significant heterogeneity in effect sizes (Qs > 58, ps < .001; I2s > 82%).

3.3 MODERATOR ANALYSES

Meta-regression analyses tested whether effect sizes differed based on green ad characteristics, product involvement level, or consumer demographics (Table 4).

Of the ad characteristics, green appeal type significantly moderated the green advertising-consumer behavior relationship. Ads with specific appeals highlighting environmentally-friendly product attributes had significantly larger effects (r = .418) than ads with more general sustainability appeals (r = .283, B = .135, p < .001). Ad medium and executional framework did not significantly moderate effect sizes.

Product involvement level was also a significant moderator. Green ads for high involvement products had a stronger impact on consumer behavior (r = .359) than ads for low involvement products (r = .246, B = .113, p < .01).

In terms of demographics, age and gender significantly moderated green advertising effectiveness. Effect sizes were larger for younger consumers (B = -.017, p < .001) and women (B = .003, p < .05). Country did not moderate effects, with similar effect sizes across Western and Asian markets.

Table 4. Moderator Analyses

Moderator Variables	k	B	95% CI	p-value
Green Ad Characteristics				
Specific (vs. General)	50	.135	[.085, .185]	<.001
Environmental Appeal	50			

Digital (vs. Print) Medium	42	.014	[-.057, .084]	.705
TV (vs. Print) Medium	26	.069	[-.028, .166]	.163
Emotional (vs. Informational) Framework	44	.051	[-.012, .113]	.112
Product Characteristics				
High (vs. Low) Involvement	50	.113	[.039, .187]	.003
Consumer Characteristics				
Mean Age	50	-.017	[-.024, -.010]	<.001
Gender (% Female)	50	.003	[.001, .006]	.011
Asian (vs. Western) Country	50	-.026	[-.100, .048]	.490

3.4 PUBLICATION BIAS

Funnel plots for each consumer behavior outcome showed some asymmetry, with smaller studies tending to have larger effect sizes. However, Egger's regression tests were non-significant for all outcomes (ps > .10), suggesting no clear evidence of publication bias. Applying the trim-and-fill method did not change meta-analytic effect sizes, as no studies were imputed.

Fig 1- Example data for funnel plot

4. DISCUSSION AND CONCLUSIONS

4.1 EFFECTIVENESS OF GREEN ADVERTISING IN MOTIVATING SUSTAINABLE CONSUMER BEHAVIOR

Results from this meta-analysis of 50 empirical studies offer strong evidence that green advertising can significantly influence consumers' environmental attitudes and behaviors. Across all studies, exposure to green advertising had a positive and significant impact on sustainable consumer behavior, with a mean correlation of r = .316. This effect size is comparable to meta-analytic estimates for other important drivers of green consumption like environmental concern (r = .30) [13] and perceived consumer effectiveness (r = .34) [12].

Green advertising's impact was most substantial for environmental attitudes, with a mean correlation of r = .384. This large attitudinal effect is encouraging, as it suggests green ads can generate more favorable evaluations of sustainable products and eco-conscious consumption. Influencing environmental attitudes is an important precursor to changing green purchase

behavior, as attitudes are a key driver of intentions and behavior in most consumer decision-making models [19].

However, the effects of green advertising were more modest for downstream behavioral outcomes. While still significant, the impact of green ads was smaller for purchase intentions (r = .273) and actual purchase behavior (r = .141). This pattern is consistent with the well-documented "attitude-behavior gap" in sustainability, where consumers' pro-environmental attitudes often do not fully translate into green purchases [20].

The significantly weaker effect on actual purchases compared to attitudes and intentions confirms green advertising alone may not be sufficient to shift consumption toward more sustainable options. Even when green ads generate positive attitudes, other factors like higher prices, limited availability and lack of perceived efficacy can inhibit green purchasing [21]. Strategies beyond advertising, such as price discounts or increasing distribution of green products, may be needed to convert positive attitudes into substantial behavior change.

4.2 MAXIMIZING GREEN ADVERTISING EFFECTIVENESS

The Role of Ad Appeals, Product Involvement and Target Audience Moderator analyses highlighted several ways green advertising effectiveness could be enhanced. Ads using specific environmental appeals focusing on green product attributes had larger effects than ads with only general sustainability claims. Specificity in green ad messaging, such as highlighting recycled packaging or organic ingredients, may be more impactful because it increases the perceived credibility and diagnosticity of environmental information [22]. Vague or unsubstantiated green claims are more likely to breed consumer suspicion and limit persuasive impact [23].

Green ads were also more effective for high involvement products. Consumers tend to engage in more extensive information processing when purchasing high involvement goods [24]. They may pay more attention to and place greater weight on green appeals for these purchases. High involvement contexts could also induce more thorough elaboration of environmental ad claims, enhancing persuasion [25]. In contrast, green appeals may be less salient and impactful for low involvement purchases made with little deliberation.

In terms of targeting, green advertising had stronger effects on younger consumers and women. This aligns with prior research showing greater environmental concern and willingness to pay for eco-friendly products among these segments [26,27]. Green ad appeals may resonate more with the values and identity of younger and female consumers. Advertisers should consider these demographic differences in sustainability orientations when developing targeted green campaigns.

Interestingly, green ad effectiveness did not vary significantly across cultural contexts. Similar effects were observed for studies conducted in Western and Asian markets. This suggests the influence of green advertising may be relatively consistent cross-culturally, at least for the countries represented in this analysis. However, more research is needed to determine if this cultural invariance extends to other international markets, especially those with differing levels of environmental concern and green consumption norms.

4.3 LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This meta-analysis has several limitations that highlight avenues for further research. First, the scope was limited to studies measuring consumer-level responses to product-focused green ads. Future syntheses could examine the broader effects of corporate-level sustainability advertising on firm-level outcomes like brand attitudes and financial performance.

Second, the relatively small number of studies measuring actual purchase behavior constrained investigation of moderators for this outcome. As more studies track real purchasing, researchers can better assess factors shaping when green ads affect not just attitudes and intentions but consumption behavior.

Third, this analysis focused on advertising's impact on individuals. Emerging research suggests green ads can also have social influence effects, where seeing others' positive responses shapes observers' own attitudes and choices [28]. Capturing these interpersonal effects and how green advertising impacts social norms is a valuable direction for future study.

Finally, advertising is just one part of a larger green marketing mix. More research is needed on the interplay between green advertising and other sustainable marketing levers like eco-labeling, green packaging and sustainability-focused promotions. Examining synergistic effects of multiple green marketing elements will provide a more holistic assessment of the drivers of environmentally-conscious consumption.

4.4 IMPLICATIONS FOR THEORY AND PRACTICE

Findings from this meta-analysis inform theoretical understanding of the determinants of sustainable consumer behavior. Results underscore the important role of marketing communications in shaping environmental attitudes and consumption. While attitudinal factors like environmental concern and values are often emphasized as precursors to green behavior, this synthesis demonstrates the substantial influence of contextual factors like advertising.

The smaller effects on actual purchase behavior compared to attitudes and intentions also provide further empirical support for the attitude-behavior gap in sustainable consumption. This highlights the need for more integrative theories specifying the personal and situational factors that facilitate or inhibit translation of environmental attitudes into green purchasing.

Practically, this meta-analysis offers guidance for how companies and policymakers can harness green advertising to encourage sustainable consumption. Results suggest a three-pronged approach may be most effective. First, ads should incorporate specific, credible claims about products' environmental benefits. Vague or unsubstantiated green appeals are less likely to engage consumers. Second, green ads may be most impactful for high-involvement products that prompt deeper information processing. For low-involvement goods, green appeals may need to be especially salient and easy to evaluate. Finally, younger and female consumers appear most receptive to green advertising. Targeting these environmentally-oriented segments may yield the greatest return on green ad investments.

More broadly, findings indicate green advertising can be a valuable tool for promoting sustainable consumption, but must be supplemented by other strategies. While green ads can generate more positive attitudes and intentions, additional interventions like price incentives

or increased availability may be needed to convert these favorable dispositions into substantial behavior change. An integrative approach combining effective green advertising with a supportive marketing mix and policy environment may be key to realizing sustainable consumption on a meaningful scale.

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