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DEPARTMENT OF POLITICAL SCIENCE

THE PERSUASIVE POWER OF GREEN

A 2x2 Experimental Study on Colour and
Persuasion Knowledge in Environmental Policy
Communication

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Abstract

This study investigates the persuasion effect of colour, specifically green, on environmental policy advocacy in political communication. Although business research has shown that colour can influence consumer behaviour and attitudes, there is a lack of systematic research on whether it has a similar effect in political communication. To fill this research gap, the researcher uses the Persuasion Knowledge Model (PKM) and colour congruence as a theoretical basis to examine whether green can enhance people's attitudes and support towards environmental policies. This experiment adopted a 2 (background colour: green vs. grey) \times 2 (persuasion knowledge level: high vs. low) design and collected responses globally through an online survey. The result showed that although green is considered to have a higher congruence with environmental messages, it does not significantly increase people's advertisement attitude and policy support. Persuasion knowledge has a stable effect on attitude, while there is no significant interaction between it and the background colour. The findings suggest that it is challenging to drive changes in attitudes and behaviours and use green in the political field, despite its symbolic connotations with the environment. The result also challenges the colour persuasion theory in political communication.

Keywords: persuasion knowledge, colour psychology, green advertising, political communication, colour congruence

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1. Introduction

Persuasion is essential in political communication, influencing policy acceptance, voter behaviour and political participation (Eagly & Chaiken, 1993; Lau et al., 2020; Petty & Cacioppo, 1986). One of the goals of political communication is to encourage people to accept specific values and policy proposals. Effective political persuasion strategies can shape public opinion (Kim et al., 2009; Eagly & Chaiken, 1993), influence the Processing of Information (Eagly & Chaiken, 1993), and arouse emotions (Albertson et al., 2020). Therefore, a deep understanding of how persuasion works politically is significant for academic research and practical strategies.

According to dual processing theory, such as the elaboration likelihood model (ELM), persuasion can be carried out through two routes. The central route relies on people's analysis and processing of the message. In contrast, the peripheral route relies on simplified cues, such as visual symbols, colours, and the source of information for faster judgments (Eagly & Chaiken, 1993; Petty & Cacioppo, 1986). In a political context, peripheral route persuasion occurs through visual symbols, which quickly attract attention, trigger emotional responses, and reinforce group identity. For instance, colour can serve as a low-level heuristic cue, allowing people to promptly judge the source and value of information without deeply analysing the content, especially using colours as symbols (Alturas et al., 2024). As a visual language, colour is one of the persuasion tools that deserves further exploration.

Colour is a potential strategy in persuasion. Past studies have shown that colour influences people's attitudes towards brands, products or corporate social responsibility (Bottomley & Doyle, 2006; Sundar & Kellaris, 2017). However, research on the influence of colour in political persuasion is still relatively scarce. For example, using red and blue on the political spectrum (Casiraghi et al., 2023). Not to mention the lack of discussion on its application in environmental policies.

In response to this research gap, I want to explore the following question: Will the persuasion effect of green in the political field be the same as previous business research? Will this effect be determined by how people are aware of this strategy? This study referred to how business brands influence consumer behaviour through colour and applied this theory to the political field, exploring whether green is more persuasive in environmental policies or may arouse people's suspicion. I also introduced the Persuasion Knowledge Model (PKM) to examine whether different levels of persuasion knowledge would moderate the persuasion effect of green in environmental policies. A 2 (background colour: green vs. grey) \times 2 (persuasion knowledge: high vs. low) experimental design analyses how colour and persuasion knowledge affect people's advertisement attitudes and policy support individually and interactively through an online survey of a global sample.

The survey manipulated colour and persuasion knowledge to observe the impact on policy support and attitude. Through this study, I hope to clarify the conditions and limitations of colour as a peripheral cue in political persuasion. Understanding the persuasion role of colour in politics provides suggestions for political organisations and policymakers regarding visual communication strategies, and develops future research on colour and political colour psychology.

2. Literature review

This chapter will then conduct a literature review from three aspects: first, review the role and psychological mechanism of colour in political and business communication; second, explore how green is used and interpreted as a symbol of environmental protection; finally, explore how key variables such as colour congruence, persuasion knowledge regulate the persuasion effect of colour, laying a theoretical foundation for the experimental design of this study.

2.1 Visual communication and the persuasion potential of colour

Visual images are generally processed faster than text, as reading and interpreting texts require more cognitive abilities. This can make visual persuasion particularly effective in attracting attention. Images can convey information quickly and make viewers prioritise image content in advertisement and news (Mosallaei & Feldman, 2024).

Colour is one of the visual images that caught researcher's attention. Colour is widely used daily and can influence emotions, cognition and behaviour. From a biological perspective, the perception of colour is physiologically rooted in humans. Some colours may elicit visceral responses, such as red being associated with danger, responses that enhance arousal and attention, possibly due to evolutionary adaptations (Lennie, 2003). Colour also induces behavioural preferences of people, such that red induces avoidance motivation and impairs intellectual performance, without awareness or intention (Elliot & Maier, 2007). Colours can be used to evoke emotions traditionally. The communicator uses colours to manipulate the potential emotions and cognitions of the people and connects with particular things.

The emotional associations evoked by colours are widely used in the business field. As a visual persuasion tool, colour on the packaging is used to reflect product attributes and influence consumer perception. For example, food in blue packaging is considered utilitarian rather than hedonic and healthier than food in red packaging (Huang & Lu, 2016). People rely on packaging colour to infer health content when no information is available. Although the study was not very convincing due to the sample size (n=120), it still illustrates the impact of colour on perceptions.

Colours also arouse people's emotions and create prejudices against political parties using various colours. Losada Maestre and Sánchez Medero (2024) found that people in Spain view red as progressive and blue as conservative. Research has found that colour may activate partisanship, causing participants to align their responses with their ideology.

Colour-product congruence is considered a key way of strengthening perception. Bottomley and Doyle (2006) discovered that colour congruent with the product is considered more appropriate. Colour is also the main distinguishing feature between a set of tasks. If the brand's colours match the team's colours, it strengthens the brand's image as a sincere supporter of the team, resulting in a more favourable evaluation from fans (Henderson et al., 2019). This congruence helps build stronger emotional connections and increases the overall perception. In other words, using the wrong colour for the incorrect product will make consumers feel incongruent and reduce their support and favorability.

2.2 The identification and symbolic functions of colours in politics and business

2.2.1 Colour as political branding: ideological association

Colour is an essential element of brand identity. Companies differentiate themselves from competitors by using colours in advertisement, strengthening the connection between brand and colour. For example, Coca-Cola and the colour red, and Pepsi and the colour blue, have established strong visual associations (Garber et al., 2003). Colour is also a symbolic visual choice used to identify political messages in the political field.

The link between political ideologies and colours has become symbolic in some countries. For example, in the Western European political tradition, left-wing parties are often associated with red, representing socialism and reform. In contrast, right-wing parties prefer blue, symbolising stability and conservatism (Casiraghi et al., 2023). This shows that colours are being used to represent the ideology for congruence in the political field.

This connection between colours and politics is also reflected in campaigns. Political organisations often strengthen representative colours in posters, advertisements and slogans to consolidate identification with their brands and values (Ademilokun & Olateju, 2016).

However, the relationship between political parties and colours is not static. Political parties or candidates may change their use of colours in response to a crisis, image reconstruction, or strategic needs. For example, the conservative party in South Korea changed its name and representative colour from blue to red after scandals and setbacks. It eventually rebuilt its brand and won the 2012 general election (Hong, 2023). This shows that colour can reflect ideology and be a strategic tool for image reshaping.

2.2.2 Colour and identity: tools to arouse emotion

Colour not only arouses emotions and behaviours, but also has symbolic connotations for identity. For instance, political parties inspire voter support and loyalty through colours associated with the national flag. The strategy evokes the emotional connection between patriotism, national identity and values.

The traditional colour-political spectrum - such as the red for left and the blue for right - does not apply. Parties may adopt completely different colour matching strategies, or even deliberately break away from existing political colour classifications when colours are combined with patriotism. The United States is a representative example. Before the 21st century, the campaign logos of the two parties usually included both red and blue, expressing a commonality with the national flag (Walter, 2023). It was not until around 2000 that the media began associating red with the Republican Party and blue with the Democratic Party.

Similar phenomena are also common in non-Western countries. Conservative parties often use colours to represent the national flag as their identification. For example, Japan's conservative Komeito Party uses red as its primary symbolic colour, echoing the colour of the Japanese flag (Casiraghi et al., 2023). While red may be seen as a progressive or leftist colour in other contexts, it is transformed into a national symbol here.

Overall, the role of colour in political communication goes far beyond decoration. Its importance lies in how political organisations strategically connect colour to specific values. Colours have gradually developed stable associations with politics and have repeatedly appeared, influencing the public's interpretation of political information and the formation of political perceptions.

2.2.3 Colour and behavior: from political preference to consumer choice

Colour indirectly influences the political field, and is based on cultural context and personal perception. First, the connection between colours and political organisations will trigger people's preference for specific colours, strengthening group identity. Schloss and Palmer (2014) found this phenomenon particularly evident during elections: people tend to prefer the colours of the political party they support. For example, Democratic supporters prefer blue on Election Day, while Republican supporters prefer red. This shows that colours represent ideology and deepen the sense of political belonging in the election.

Secondly, colour also affects consumption behaviour. Yaacoub et al. (2014) found that consumers are more likely to buy products that match the colour of the political party they support during elections, especially low-priced goods. In addition, people who pay attention to political news are more sensitive to the political connotations of colours, and specific political events will also promote their preference for related colour products. This type of political consumption reflects that colour is not just a visual design, but also influences behaviour.

2.3. Green as an environmental symbol and its persuasion power

2.3.1. The symbol of green: persuasion potential in environmental communication

Green has become the representative colour for companies and organisations to create an environmentally friendly image. Research indicates that green stabilises and calms and is also closely associated with natural environments such as forests and plants (Lennie, 2003). These characteristics give green a potential persuasion advantage when advocating environmental protection issues. In public spaces, business and political communications, green represents the environment, sustainability and ethical responsibility.

Although research on green in the political field is still limited, plenty of results in the business field confirm its persuasion potential. Consumers generally associate green with environmental protection and moral responsibility, increasing brand favorability and trust (Lim et al., 2020). For example, green product labels can enhance a brand's green image, even if the company itself does not necessarily take environmental actions (Seo & Scammon, 2017). Other studies have also pointed out that green visual design can enhance customers' evaluation of corporate social responsibility, even if the corporate behaviour is controversial (Sundar & Kellaris, 2017; Lee, 2018).

2.3.2. The use of green: pros and cons

Green symbolises environmental protection in politics and has a psychological influence on business. As a colour closely related to nature, green is often used to create an environmentally friendly image for products, influencing public perception and behaviour.

First, green is a hint of environmental protection, which can quickly guide people to perceive positively without detailed information. Studies have shown that a green logo increases people's environmental protection evaluation, while a red logo reduces this perception (Ranaweera & Wasala, 2020). Environmentally friendly colours, such as green, can make morally ambiguous behaviours appear more justifiable. In contrast, non-environmentally friendly colours such as red make the same behaviours appear less moral (Sundar & Kellaris, 2017). In other words, as part of an organisation's identification, green helps create a positive impression and enhances moral legitimacy.

Secondly, green has a nudging effect which can quickly shape people's trust in brands or organisations, especially when information is insufficient. Lee (2018) pointed out that using green in a shop's interior can enhance customers' environmental perception of the brand, especially for those less concerned about environmental issues. Although the nudging effect of green is not absolute and is limited by the brand and consumer awareness, research has found that low-saturation green can increase consumers' trust in a company's environmental protection commitments, thereby affecting purchasing intentions and increasing the likelihood of consuming sustainable products (Pichierri & Pino, 2023).

However, the use of green strategies also has potential risks. Seo and Scammon (2017) pointed out that green packaging may mislead consumers into believing that the brand has more environmental practices, even if this is false. These visual misleads can cause consumers to overestimate the brand's environmental contribution or even have a wrong perception.

Lim et al. (2020) further pointed out that green becomes a hint for environmental protection in certain situations. However, it may cause distrust when the public finds that the brands' commitment is incongruent with green messages. In other words, the excessive use of green can be seen as a way to manipulate impressions if a political organisation does not take any real environmental action, damaging its image and credibility.

2.4. Colour as a peripheral cue: the elaboration likelihood model (ELM)

This study focuses on the persuasion effects of political messages. However, people may decide based on their party identification, even if the parties they dislike present a good policy (Campbell, 1960). This highlights the importance of the formation of information sources in political attitudes.

Nonetheless, research in recent years has pointed out that how the message is presented also plays a key role in persuasion. The Elaboration Likelihood Model (ELM) explains how people take different information processing paths at varying levels of involvement. People tend to think deeply when they are more engaged in an issue. Conversely, people are more likely to rely on superficial message clues to make judgments when they are less involved (Petty & Cacioppo, 1986).

In such a situation, colour may unconsciously influence people's attitudes and perceptions as a peripheral cue. In particular, green may play a nudging role in environmental policy communication because of their strong connection to environmental protection. However, other factors may also enhance or weaken this persuasion effect.

Therefore, the researcher will further discuss the ELM and review how studies explore the influence mechanism of colour in political communication by manipulating subjects. This discussion will lay

the theoretical foundation for explaining how colour might be the potential nudge on people's attitudes and behaviours in political communication

2.4.1. Overview of the ELM

The Elaboration Likelihood Model (ELM) is one of the theories for understanding how different factors affect people's attitudes during persuasion. The model explains how people process persuasion messages through two main routes: the central route and the peripheral route (Petty & Cacioppo, 1986).

According to the ELM, people's involvement level affects the process of information and focus. The personal relevance of information, cognitive needs, and various situational variables (such as distraction) may influence strategies for processing data. Individuals are more likely to process information through central routes when personal relevance is high. In contrast, when people lack motivation or have a high cognitive load (e.g., distraction, limited time), they tend to adopt a peripheral route, process messages in a more superficial, heuristic way—for instance, relying on external cues such as the attractiveness, prestige, or visual cues of the message source (Petty et al., 1984; Eagly & Chaiken, 1993).

Individuals tend to use the central route to process information in high-involvement situations. In this situation, people invest cognitive resources to carefully evaluate the logic, rationality, and strength of the message's evidence. For instance, people will pay more attention to the rationale of the policy rather than numbers when the topic involves the people's interests, such as policy reform within a school (Petty et al., 1984). Petty et al. (1983) also found that people may ignore peripheral cues such as celebrity endorsements in highly involved situations. Instead, they focus on the core content of the information.

In contrast, individuals typically lack sufficient motivation to engage in deep processing in low-involvement situations. People mainly rely on peripheral clues to make quick judgments, such as the colour, layout design, number of words, spokesperson or other visual elements of the message. These peripheral cues may change attitudes even when the message lacks strong arguments (Petty & Cacioppo, 1986). Petty et al. (1983) also pointed out that celebrity endorsements are more influential in low-involvement situations than high-involvement ones, demonstrating their persuasion power as peripheral cues.

Therefore, peripheral information such as colour, images, or logos may influence attitude evaluations in low-involvement or high-distraction situations. This has important implications for political communication, primarily when people cannot devote much attention or lack an existing position on an issue, so that visual cues may become the basis for people's initial attitudinal responses.

2.4.2 Colour as peripheral cues in political communication

Visual cues play a key role in persuasion communication. Levy and Peracchio (1995) found that colour ads attracted more attention and produced stronger persuasion effects than black and white ads, especially if the people's motivation is low. Black and white design is more persuasive as it reduces visual complexity and distraction. This shows that the impact of visual elements such as colour depends on the audience's engagement with the message.

A similar phenomenon can be observed in political communication. When people are less engaged in political issues, visual cues such as colour, symbols, and layout configuration can become the primary basis for decision-making. Reynolds and Steenbergen (2006) pointed out that in some countries with low literacy rates or fierce electoral competition, ballot design often relies on colours and symbols to help people identify candidates and parties, which not only speeds up judgment but may also increase voting intention. Colour provides an easy and effective identification tool for those who have difficulty reading their ballots.

In addition, colours can also serve as visual symbols of political identity and preferences. Alturas et al. (2024) pointed out that representative colour can be a synonym for political platform, allowing people to quickly identify the source and ideology of information without in-depth analysis of policy content, affecting their attitudes or support.

However, the persuasion role of colour in political communication has not been extensively studied. Previous research has mainly focused on the strategies of colour in ballots and election campaigns (Alturas et al., 2024; Reynolds & Steenbergen, 2006) or the impact of party colours on personal preferences (Schloss & Palmer, 2014; Yaacoub et al., 2014). Few studies have addressed the persuasion power of colour, especially green. As a colour with environmental significance, Lim et al. (2020) suggest that green serves as a peripheral cue and may affect the persuasion effectiveness of information, especially in low-persuasion situations.

2.5. Awareness in persuasion: the role of persuasion knowledge model (PKM) and perceived manipulative intent

2.5.1. The PKM and perceived manipulative intent (PMI)

The above discussion points out that colour, as a peripheral cue, may have a potential persuasion effect on political messages in low-involvement situations. However, whether visual signals can change people's attitudes depends on the level of involvement and individuals' cognitive assessment of persuasion intent. This is precisely what the Persuasion Knowledge Model (PKM) focuses on.

The Persuasion Knowledge Model (PKM) describes how message receivers understand, evaluate and respond to communication messages that attempt to influence them. The model points out that when people receive persuasion messages, they do not just focus on the content. Instead, they also infer the communicator's purpose and strategy based on experience to judge whether the message is trustworthy (Friestad & Wright, 1994). The model has been applied to explore how individuals respond to messages, especially in the business (Campbell & Kirmani, 2000).

PKM points out that people evaluate the credibility and intent of the message based on persuasion knowledge, thereby affecting their attitudes and actions toward the information (Friestad & Wright, 1994). Once people discover perceived manipulative intent (PMI) behind the message, they may become suspicious of it, weakening its persuasionness. For instance, Hirsch et al. (2024) found that people tend to have a negative attitude toward the message and the agent if the message has a manipulative intent. People may distrust or resist the message under this situation. In other words, the higher the PMI level, the easier it is for the persuasion effect to be weakened, and it may even cause disgust and resistance.

In political communication, colours are closely linked to ideology or policy symbols. However, this strategy may lead to an adverse reaction if viewers perceive the use of colour as a strategic manipulation. Whether the message is accepted will depend on whether the audience activates vigilance and suspicion of the persuasion intention. Therefore, I further explore the application of PKM in visual persuasion strategies. This helps reveal how people identify, evaluate, and respond to political messages that attempt to influence their attitudes and behaviours through colour.

2.5.2. PKM in business and political contexts

PKM states that people interpret the purpose and credibility behind the message more deeply when their PMI is activated. Chen and Cheng (2020) pointed out that people with higher persuasion knowledge (HPK) can better identify the strategies used in messages and make critical judgments on their authenticity and effectiveness. Not only are they more resistant to false information, but they are also more capable of identifying manipulative behaviour.

In contrast, individuals with LPK are usually less likely to detect PMI in messages. They are therefore more likely to accept the messages and generate a positive attitude. For example, Evans and Park (2015) found that covert advertisement reduces the audience's defensive reactions if presented unnoticeably. People are likely to have positive attitudes and emotional responses when they do not regard the message as an advertisement to promote products. This indicates that the level of persuasion knowledge affects the persuasion effect.

Persuasion knowledge (PK) also plays a key role in political communication. Hirsch et al. (2024) pointed out that individuals who are sceptical about climate change are more able to rationally evaluate the feasibility of climate adaptation policies and take actions if they are in HPK. Such individuals are more sensitive to information and have stronger abilities to participate and discuss the topic actively.

PK may also affect the receptivity to political messages and the evaluation of political organisations. Noetzel et al. (2024) pointed out that the PMI negatively correlates with party evaluation, especially when low political fit. People are more likely to have higher PMI and negative attitudes if there is a low fit of values or ideology, even if the party proposes reasonable policies (Binder et al., 2022). This shows that PMI triggers PK, causing audiences to interpret messages more critically in the political field.

In addition, PK is also stimulated by individuals' self-assessments of their understanding of persuasion strategies. Subjective PK enables individuals to cast doubt on political advertisement and evaluate the advertisement's motives (Nelson et al., 2021). They may believe that they can identify false or misleading propaganda tactics, and this subjective persuasion knowledge can also trigger critical interpretations and resistance responses.

The PKM provides a framework for understanding how individuals respond to persuasion messages. The strength of PMI affects the level of PK, determining the trust and acceptance of the message in both business and politics.

3. Research question

The research question of this study focuses on the impact of green in political persuasion. In other words, to discuss whether the congruence between colour and policy content can enhance people's support for policies, or is just a visual manipulation that may even arouse suspicion.

Although some studies have shown that colour can potentially affect people's perceptions and behaviour, especially the impact of green in business, whether green is a decisive persuasion factor is still worth considering. Francis (2014) claims that a green logo can increase people's environmental awareness of a company, especially those considered less environmentally friendly. However, the difference between the two groups was not significant. Second, a survey study on psychology found that the background colour of the survey did not affect the measurement of subjects' attitudes towards the environment, but only caused measurement bias on the respondents' emotional state (Müller, 2014).

The above research results show that colour may not play a key role in changing choices in persuasion strategies, but may play a boosting role. In politics, other factors may influence individuals more than colour. This implies that people may rely on the policy content rather than colour when deciding whether to support the policy. Therefore, although colour has a symbolic meaning and social connection, its impact on voter behaviour may be small. In contrast, colour may evoke emotional resonance or imply a specific ideology, but it is difficult to directly connect with people's political beliefs and change people's behaviour.

This is still an interesting research topic, even if past research implies colour may have a limited impact on people. Research on colour in politics remains sparse, mostly restricted to traditional left-red/right-blue related studies. Much of the green research, which has been popular in recent years, focuses on its application in the business field. This is precisely what this study hopes to explore: combining green with the political field to test the persuasion boosting effect of green in environmental policies. We can still understand the influence of colour in political persuasion, even if the study finds that the impact of colour is limited.

First, previous research in the business field shows that consumers' trust and favorability towards the brand will increase significantly when a product's colour matches its characteristics (Bottomley & Doyle, 2006). This study extends this theory to the political field, specifically comparing whether environmental policy advertisements trigger different responses when paired with green (congruent) or grey (incongruent) backgrounds.

Second, the study will discuss the interaction between persuasion knowledge and colour. According to the Persuasion Knowledge Model (PKM), cognitive defence mechanisms will be activated when the audience realises that a message may have manipulative intent, leading to questioning or disliking the message (Friestad & Wright, 1994). This study divided the audience's persuasion knowledge level into HPK and LPK to test whether the audience interprets colour cues differently under different conditions. In particular, will there be a counter-effect when HPK subjects perceive that green is used to strengthen the environmental image?

RQ: Will colour-policy congruence enhance the people's advertisement attitude and policy support in environmental policy advertisement? In addition, does the people's level of persuasion knowledge moderate the effect of colour-policy congruence?

4. Theoretical Framework & Hypotheses

This study focuses on colour congruence and the Persuasion Knowledge Model (PKM) to explore the role of green in political communication. The way and content of messages delivered can influence public attitudes. Political communication is no longer limited to the study of political parties, but emphasises which strategies have the potential to persuade the public.

Visual cues can grab attention on messages and be interpreted instantly. The connection between colour and symbolic meaning makes colour a potentially persuasion tool. Colour congruence points out that people interpret the message as sincere and credible if the colour is congruent with its theme or values, thus creating a higher level of favorability and acceptance of the message. On the contrary, if the colour does not match the content, people may feel confused or doubtful, weakening the persuasion effect (Henderson et al., 2019).

Green has long symbolised the environment and sustainability. Companies and organisations have tried to create an image of being committed to sustainability by using the colour green in visuals (Lim et al, 2020; Ranaweera & Wasala, 2020). Past research confirms that when packaging or logos are green, consumers automatically infer that the brand is eco-conscious, even if this is not necessarily the case (Seo & Scammon, 2017). However, whether such an effect can have the same persuasion power in political situations remains to be verified.

On the other hand, the Persuasion Knowledge Model (PKM) shows that people infer the motivations behind the messages based on their own knowledge, agent knowledge, and persuasion knowledge. Once they perceive the message as manipulative intent, they activate cognitive defence mechanisms to reduce or resist the persuasion effect (Friestad & Wright, 1994).

Such mechanisms are particularly critical in political communication. When political organisations use green in advertisements to promote environmental policies, people may question whether this is just strategic packaging rather than a genuine commitment (Hirsch et al., 2024).

For LPK individuals, colour is a simplified peripheral cue that can provide a shortcut to form initial attitudes when resources are limited. Still, the same cue is likely to be seen as a strategic operation, thus arousing doubts.

Combining the above concepts, this study proposed a 2 (colour: green vs. grey) \times 2 (persuasion knowledge: high vs. low) experimental framework. Colour congruence is expected to primarily affect advertisement attitude and policy support intention; however, when the persuasion knowledge is activated, this positive effect may be significantly weakened or even reversed.

Hypothesis 1: Advertisements with a green background generate more positive attitudes and support intentions than those with a grey background.

Hypothesis 2: Persuasion knowledge moderates the effect of colour. For individuals with higher persuasion knowledge, the positive impact of green-background advertisements will be significantly weaker, and may even become negative, compared to those with lower persuasion knowledge.

5. Research design and method

This study aims to explore the persuasion effect of colour in political communication, especially the impact of green as a "symbolic colour of environmental protection" in political advertisements. In addition, this study also considers the potential implications of knowledge of persuasion on colour persuasion. Therefore, this study adopted a 2 (colour: green vs. grey) × 2 (persuasion knowledge level: high vs. low) experimental design, divided the subjects into four groups, and collected data through surveys to examine the impact of the interaction between colour and persuasion knowledge on advertisement attitudes and policy support intentions. The survey provides three languages: English, Swedish, and Traditional Chinese. Native speakers proofread the survey questions' translation in the corresponding languages.

5.1 Research subjects and sample collection

The target subjects of this study are adults aged 18 and above, with no restrictions on nationality or place of residence. The purpose is to collect diverse and representative sample data to explore the impact of different manipulation methods in political advertisements on attitudes and policy support. Samples were collected mainly through two methods: (1) a web survey link and (2) a physical poster with a QR code attached.

The web survey was mainly distributed on major social media platforms (such as Facebook, Instagram, etc.). Invitations were sent via personal or university email to reach participants outside Sweden. I also provided an image with a QR code of the survey for subjects who want to share, print or answer the survey via mobile devices.

The researcher printed Physical posters and posted them in several places in Gothenburg, Sweden, including bulletin boards on the University of Gothenburg campus, entrances to public libraries, student cafeterias, parks, non-profit organisations, etc. Participants can use their mobile devices to scan the QR code on the poster to fill in the survey. To encourage participation, the research team also placed cookies near the posters as a reward for completing the survey. For more information about the survey and poster please check appendix 10.4.3 and 10.4.4.

This study collected 845 responses through Qualtrics. I used the inclusion criteria as the main approach for screening, and only set two conditions with a clear theoretical basis. The purpose is to avoid excessive and arbitrary exclusion and ensure the sample selection's transparency and scientific validity.

Firstly, the responses must be done by a human. Political persuasion is a psychological and cognitive phenomenon. If it includes responses generated by machines or automatic programs, it will not reflect the proper response and may generate noise. This criterion is made based on the RecaptchaScore value provided by the Qualtrics system. Any RecaptchaScore greater than or equal to 0.5 means the respondent is likely a human (Qualtrics). A total of 2 responses were removed, leaving 843 responses.

Secondly, the subjects must be able to distinguish the difference between colours. Since the core of this study involves colour, colour-blind people may not be able to correctly identify green and other experiment colours, which will interfere with the results. Therefore, the survey asked the subjects

whether they considered themselves colour blind, and those who answered "yes" were not included. Based on this criterion, 11 more samples were excluded, and 832 valid samples that met the requirements were retained, accounting for 98.4% of the total responses.

It is worth noting that the researcher did not exclude samples that answered the questions too quickly or only partially at this stage. During subsequent statistical analysis, such samples will be automatically processed by the system through list deletion due to the omission of individual variables. Excluding them in advance may lead to excessive sample loss. Therefore, this study only conducted a preliminary screening of conditions that were closely related to the research design and had a clear theoretical basis.

Table 1: Gender distribution of respondents (n=578)

| | Freq. | % |
|--------|-------|------|
| Male | 249 | 43.0 |
| Female | 320 | 55.4 |
| Others | 9 | 1.6 |

Table 2: Age distribution of respondents (n=578)

| | Freq. | % |
|-------|-------|------|
| 16–19 | 34 | 5.9 |
| 20–24 | 130 | 22.5 |
| 25–29 | 99 | 17.1 |
| 30–39 | 73 | 12.6 |
| 40–49 | 66 | 11.4 |
| 50–59 | 88 | 15.2 |
| 60–75 | 84 | 14.5 |
| 76–90 | 4 | 0.7 |

Table 3: Education Distribution of Respondents (n=578)

| | Freq. | % |
|---------------------------------------|-------|------|
| Elementary school or equivalent | 1 | 0.2 |
| High school or equivalent | 81 | 14.0 |
| Post-secondary education, not college | 18 | 3.1 |
| University or College | 270 | 46.7 |
| Postgraduate education | 208 | 36.0 |

Table 4: Place of birth distribution of respondents (n=575)

| | Freq. | % |
|---------|-------|------|
| Asia | 382 | 66.4 |
| Africa | 2 | 0.4 |
| Europe | 183 | 31.8 |
| Oceania | 1 | 0.2 |
| America | 7 | 1.2 |

Note: The sample size varies between 575 and 578 due to some respondents not completing the entire survey, resulting in differences in the number of responses for individual items.

5.2 Experimental manipulation and design

The experiment was divided into two treatment phases: (1) persuasion knowledge and (2) colour treatment.

The first stage of the experiment was a manipulation of persuasion knowledge. The subjects were randomly assigned to LPK and HPK groups and read the same scenario about donating to an NGO. The scenario was adapted from the study by Isaac and Greyson (2017) to manipulate the subjects' level of persuasion knowledge. The original scenario was a shopping experience: the subjects were guided to imagine choosing a jacket, and when they were hesitating between two options. The salesperson took the initiative to recommend the more expensive one. Ultimately, the subjects accepted the advice and purchased the more expensive item.

To be relevant to the political context of this study, the scenario content was changed to an NGO donation context. The subjects were also faced with two options. The volunteers were persuaded to choose the more expensive donation project. This scenario retains the structure of "choose another option because of others' persuasion" in the original design. It can guide the subjects to think about the communicator's intentions or focus on the content of the message, thereby manipulating the level of their persuasion knowledge. The HPK group was guided to think about the potential

motivations and intentions of the organisation's volunteers. In contrast, the LPK group focused on the content and impact of the initiative itself. After reading the narrative, participants were asked to rate the volunteers' attitudes and whether they thought about their intentions as manipulation checks. For more information, please refer to Appendix 10.4.2. Overall, four experimental groups are generated in the survey. Including the following:

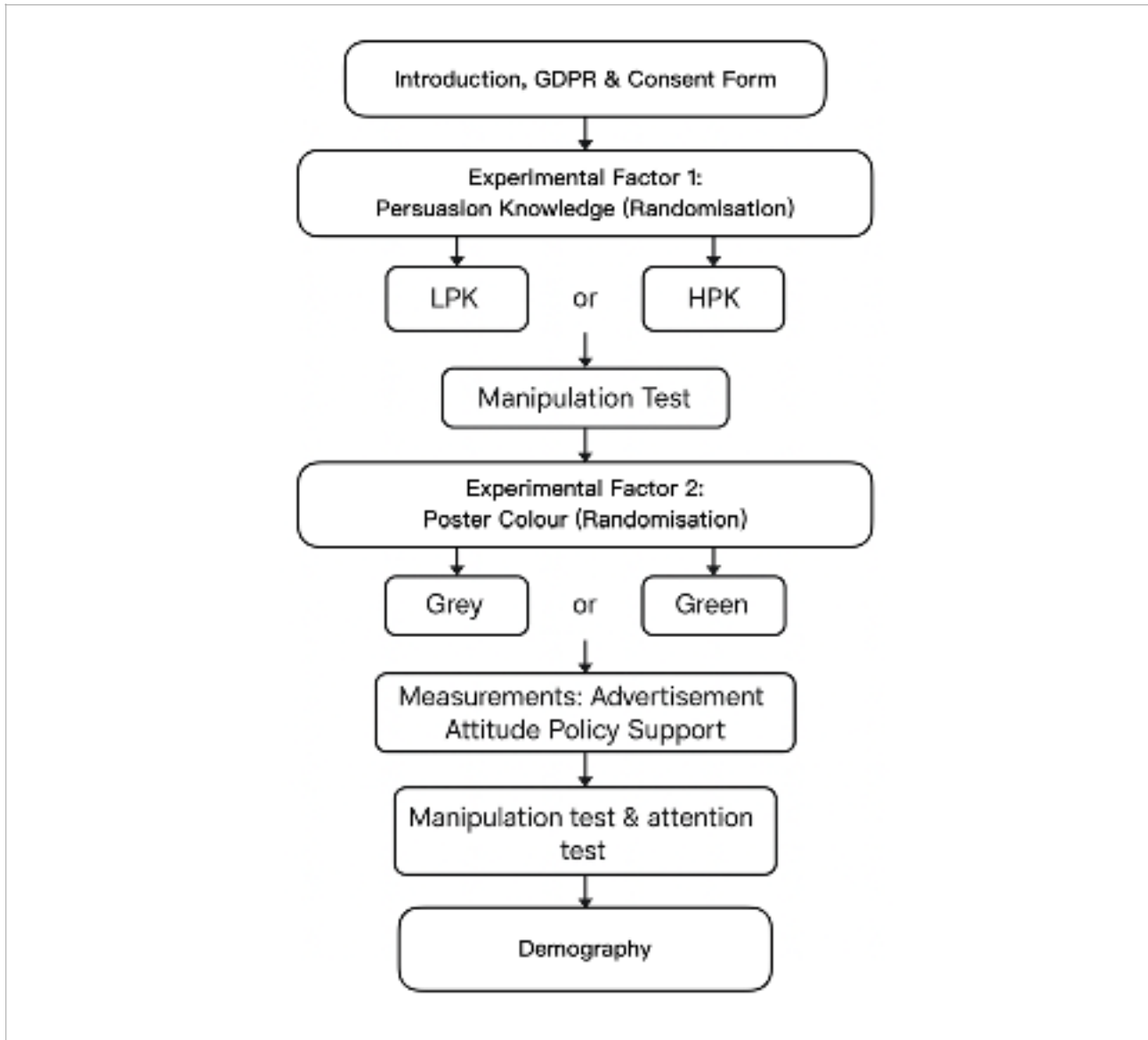
- Group 1: LPK- Green
- Group 2: LPK- Grey
- Group 3: HPK- Green
- Group 4: HPK- Grey

The second stage consisted of watching online advertisements of an NGO launching environmental initiatives. The subjects were again randomly assigned into two groups and asked to read an ad with duplicate content but with a different coloured background, green or grey. Both advertisement posters are from the fictional organisation "Gothenburg for the Future", calling for the signing of an environmental petition. The advertisement design emphasises visual congruence and similarity to real political situations. Unlike previous studies, the researcher used colours of different brightness and saturation in their posters, rather than just colours of a single brightness or saturation. The intention is to match the use of colours in real advertisement. After reading the advertisement, the survey measured subjects' attitudes towards the poster, policy support, colour congruence, etc. Finally, the subjects' demographic variables, such as gender, age, education level, and place of residence, are collected. More details on colour treatment are in section 10.4.1; information on the placement of two manipulations is in section 7.2.

Table 5: Posters for colour treatment



Figure 1: Survey flow chart



5.3 Dependent variables and scales

This study adopted a 2 (background colour: green vs. grey) × 2 (persuasion knowledge: HPK vs. LPK) experimental design. The subjects were randomly assigned to four groups to examine the main and interactive effects of colour and persuasion knowledge on the effectiveness of political advertisement.

The dependent variables include three indicators: advertisement attitude, policy support, and overall attitude. Each of the three indicators is a subscale composed of 2 to 4 questions, and its purpose is to increase the reliability and stability of the measurement. All questions are statements, with a prompt "Do you agree or disagree with the following statements?" to guide the subjects to score according to the 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

First, advertisement attitude consists of two questions: "I feel favourable about the advertisement," and "This advertisement gives me a positive attitude." Its internal congruence reliability is

Cronbach's $\alpha = .89$, indicating that this construct is highly reliable. Second, the policy support intention also consists of two questions, including "I support the organisation's proposal" and "I would sign the petition for this organisation.", with a Cronbach's α of $.77$, which is also at an acceptable level. Third, the overall attitude was measured by taking the average of the above four questions as a comprehensive indicator, with an overall reliability of $\alpha = .89$, indicating that the four questions together measured attitudes with good internal congruence. These dimensions are all measured using a 5-point Likert scale, which helps to enhance the stability and explanatory power of attitude assessment.

As for the PK manipulation experiment, subjects in the HPK group were guided to think about the potential motivations of the volunteers in the scenario. In contrast, subjects in the LPK group were asked to focus on the content and positive impact of the initiative itself. To test the manipulation effect, two manipulation check questions were designed to measure the subjects' inferences about the volunteers' motives (e.g., "I considered the volunteer's intentions a lot while reading the scenario.") and feelings about their sincerity (e.g., "I feel that the volunteer was sincere in the scenario."). The two questions were not combined into the same scale because they measured different aspects (Cronbach's $\alpha = 0.20$).

In addition, this study also designed two colour congruence manipulation check items as indicators of whether the colour manipulation is successful and can be used for subsequent analysis. The two questions are "The colour I saw in this advertisement matches the message," and "The colour I saw in this advertisement is relevant to the message." The item measures the subjects' subjective evaluation of the congruence between colour and message content (Cronbach's $\alpha = 0.86$).

5.4 Data analysis methods, research ethics and data protection

Study Data is analysed using Stata, and the methods used include descriptive statistics, manipulation tests, ANOVA, and multiple regression analysis.

The first is an independent sample t-test to detect whether the persuasion manipulation is successful and to confirm the cognitive evaluation differences between the HPK and LPK groups. Regression analysis was also used to examine whether the colour manipulation was successful and to establish that different colour treatments had differences.

Regarding hypothesis testing, H1 (main effect of colour) was conducted using ANOVA to examine whether background colour (green vs. grey) significantly impacts advertisement attitudes and policy support. Furthermore, H2 was tested by multiple regression analysis and included interaction to explore the interaction effect between colour and persuasion knowledge.

Regression models are more flexible in dealing with interaction effects than ANOVA. They can also incorporate control and continuous variables, which helps capture the dynamic change between conditional effects and different variables. Therefore, they are particularly suitable for exploring the interaction between colour and persuasion knowledge in this study.

A chi-square test is conducted as a random assignment check to ensure no significant differences among the four groups of samples in terms of demographic variables such as gender, age, education level, and place of birth. The test eliminates the effects of background factors on the experimental results and ensures internal congruence.

This study complies with the provisions of the General Data Protection Regulation (GDPR), and all participants read and agreed to the terms of participation and data use before filling out the survey. All data will be anonymized and used only for academic research, and no identifiable personal information will be disclosed.

This study did not involve any physical or psychological risks. The participation process is entirely anonymous and does not involve sensitive issues. The social background information (such as age, gender, and place of birth) collected in the survey is only used as a statistical control variable. Participants may stop answering the questions at any time without any adverse consequences. The results can promote understanding of political communication and environmental issues, help optimize relevant public policies and educational publicity, and benefit society.

6. Result

6.1 Manipulation check of persuasion knowledge and colour treatment

6.1.1 Colour treatment

I first checked whether the colour manipulation was successful, as H1 predicted that Advertisements with a green background generate more positive attitudes and support intentions than those with a grey background. Therefore, we must first confirm that green makes people think the colour and the message are congruent, while grey does not. If the manipulation failed to show the difference between two colours, the subsequent hypothesis testing will lack explanatory power.

The researcher used a sub-scale "colour congruence" to check whether the colour manipulation was effective. The scale uses two items to measure whether the subjects believe that the colours in the advertisements are congruent or relevant to the message. Quantifying the subjects' overall perception of the congruence between colour and information is an essential indicator of the success of the manipulation in this study.

Regression analysis showed that the main effect of background colour was significant ($\beta = -1.489$, $p < .001$), that is, the grey background significantly reduced the congruence score compared to the green background, with an average reduction of about 1.48 points on the Likert 5-point scale. The main effect of persuasion knowledge was not significant ($\beta = +0.097$, $p = 0.263$), indicating that subjects' scepticism about the persuasionness of information did not significantly affect their overall perception of colour congruence. In other words, the grey background was perceived as less incongruous, regardless of the subjects' persuasion knowledge.

Overall, colour congruence evaluation is far more influenced by background colour than persuasion knowledge. Colour selection significantly influences audience perception, especially in conveying environmental congruence and message coordination.

Table 6: Linear regression predicting colour congruence by poster colour and PK group (n = 583)

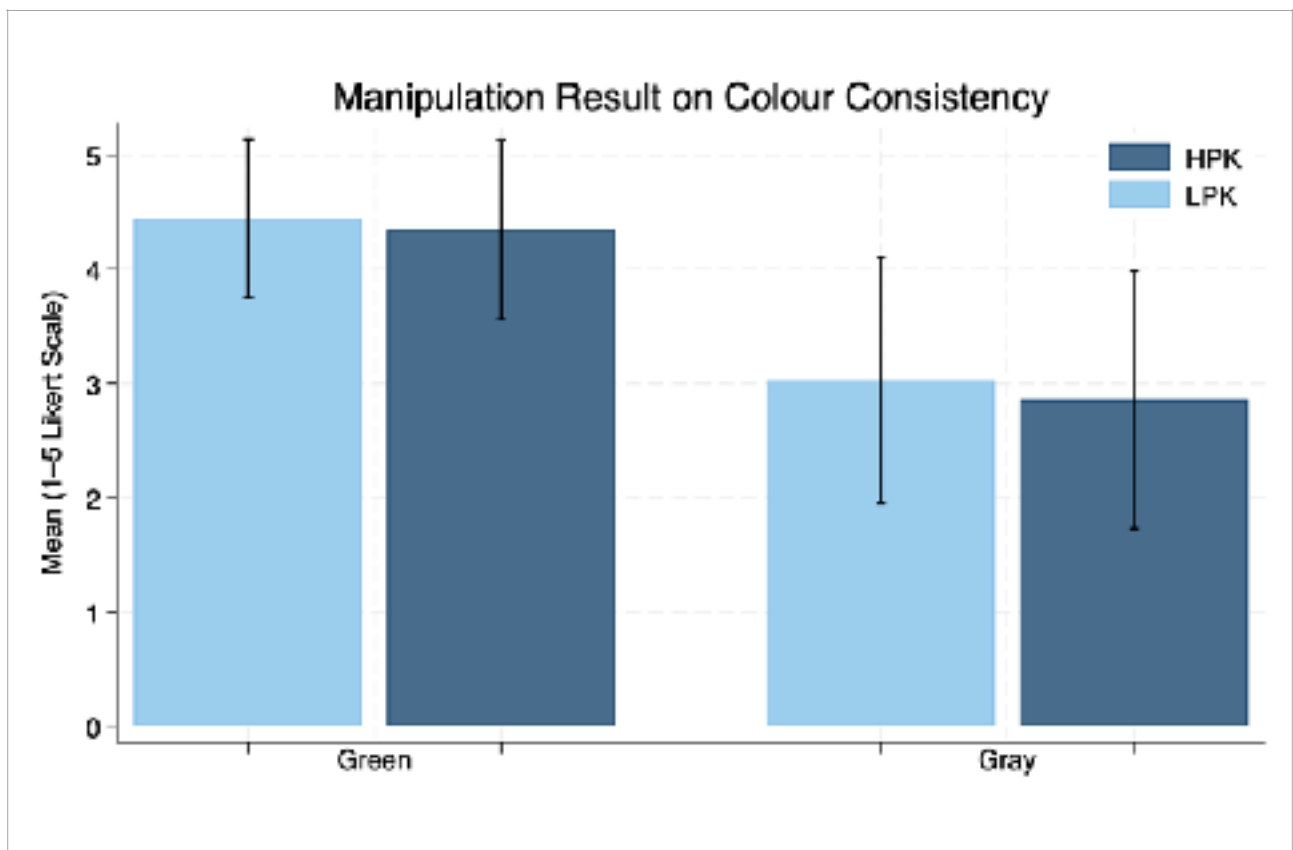
| Variable | B | SE | t | p | 95% CI |
|---|--------|-------|--------|----------|------------------|
| Poster Colour (Grey) | -1.489 | 0.114 | -12.96 | <.001*** | [-1.716, -1.264] |
| Persuasion Group (LPK) | 0.097 | 0.086 | 1.12 | 0.263 | [-0.073, 0.267] |
| Poster Colour × Persuasion Group (Grey × LPK) | 0.075 | 0.156 | 0.48 | 0.628 | [-0.231, 0.381] |
| Constant | 4.344 | 0.064 | 66.39 | <.001*** | [4.218, 4.471] |

Note. $F(3, 579) = 117.58$, $p < .001$. $R^2 = .378$. $p^* < .05$; $p^{**} < .01$; $p^{***} < .001$.

Table 7: Descriptive statistics of colour congruence by experimental group

| Group | N | Mean | Standard Deviation |
|------------|-----|-------|--------------------|
| LPK- Green | 145 | 4.441 | 0.693 |
| LPK- Grey | 149 | 3.027 | 1.075 |
| HPK- Green | 148 | 4.345 | 0.784 |
| HPK- Grey | 141 | 2.855 | 1.13 |
| Total | 583 | 3.672 | 1.186 |

Figure 2: Manipulation result on colour congruence by experimental group



6.1.2 Persuasion knowledge

Next, the researcher examined whether the manipulation of persuasion knowledge was successful. H2 predicts that persuasion knowledge will moderate the effect of colour. Subjects with HPK tend to respond less positively to green background advertisements.

Therefore, the researcher needed to confirm that HPK makes people more suspicious of the colour green, while LPK does not. Suppose it is impossible to establish that there is a difference between the HPK and LPK groups in their sensitivity to message motivation. In that case, the explanatory

power of the subsequent interaction will be weakened. Manipulation checks can establish whether the treatment successfully induces different levels of persuasion knowledge.

The researcher used two questions to examine the effects of manipulating persuasion knowledge. The questions measured how much subjects thought of the volunteer's intentions when reading the scenario, and whether they felt the volunteers were sincere. Since the two items demonstrated low internal congruence (Cronbach's $\alpha = .20$), they were analysed separately.

The manipulation checks' results partially supported the experimental design's expectations. In assessing participants' attention to the volunteer's intentions, the HPK group scored higher ($M = 3.88$, $SD = 0.99$, $n = 300$) than the LPK group ($M = 3.77$, $SD = 1.15$, $n = 304$), $t(602) = 1.26$, two-tailed $p = 0.1736$. The results showed that the HPK group was more likely to actively consider the intention of the message source when reading the situation.

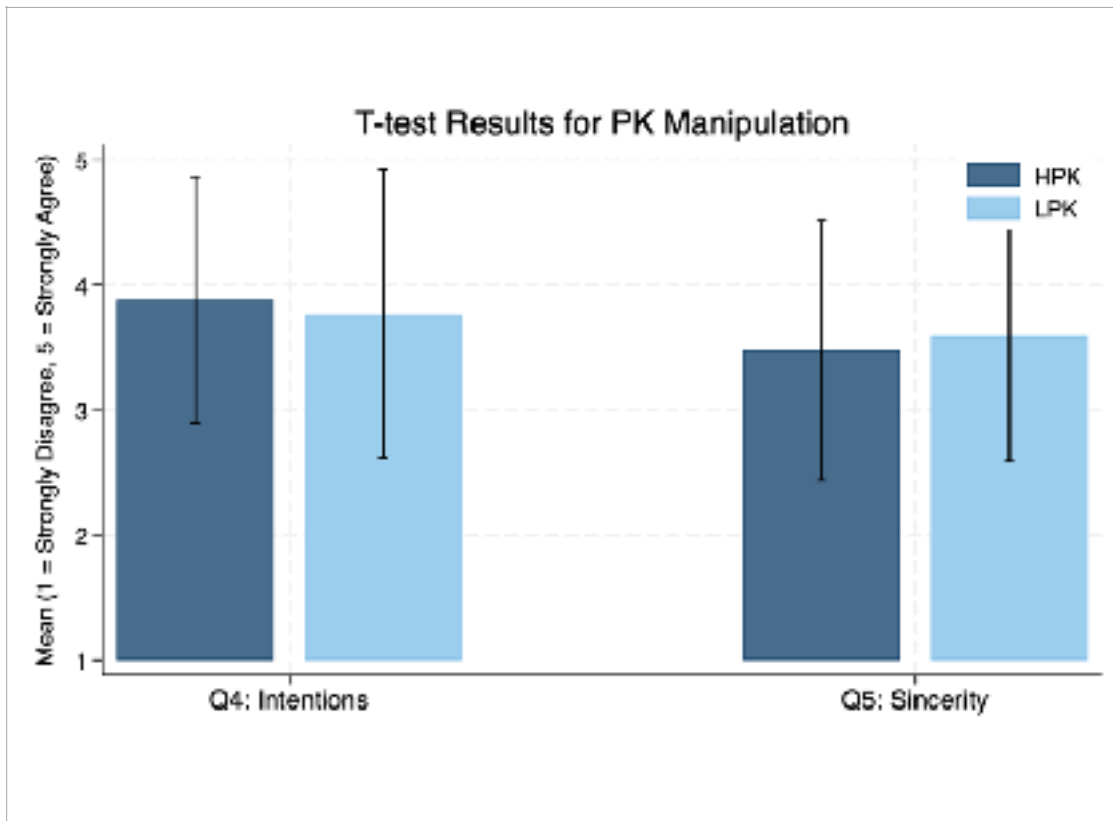
For perceived sincerity, the LPK group ($M = 3.48$, $SD = 1.04$) rated the volunteers higher than the HPK group ($M = 3.59$, $SD = 1.00$), $t(602) = -1.23$, $p = 0.217$ (two-tailed), which was not significant. The results also aligned with the previous one, with individuals showing LPK as more receptive to advertisement messages and less sceptical of their motives. While in the right direction, it is not significant. Both manipulation check indicators showed expected directions but did not fully meet the statistical significance standard.

Table 8: T-test results for PK manipulation ($n = 604$)

| Variable | Group | N | Mean | Std. Err. | Std. Dev. | 95% CI | t | p (2-tailed) / (1-tailed) |
|-------------------------------|-------|-----|------|-----------|-----------|--------------|-------|---------------------------|
| Consider Volunteer Intentions | HPK | 300 | 3.88 | 0.057 | 0.99 | [3.77, 3.99] | 1.26 | .209 / .1043 |
| | LPK | 304 | 3.77 | 0.066 | 1.15 | [3.64, 3.90] | — | — |
| Perceived Sincerity | HPK | 300 | 3.48 | 0.060 | 1.04 | [3.37, 3.60] | -1.23 | .217 / .1087 |
| | LPK | 304 | 3.59 | 0.057 | 1.00 | [3.47, 3.70] | — | — |

Note: Participants in the HPK group were more likely to consider the volunteers' persuasion intentions, while LPK group perceived the volunteers as more sincere.

Figure 3: T-test results for PK manipulation



6.2 H1: Colour effects among LPK participants

6.2.1. LPK group as samples

H1 focused on the effect of colour manipulation on participants' responses, and to more precisely test this hypothesis, the analysis was limited to the LPK group. The theoretical basis of this strategy comes from the ELM, which predicts that when there is a lack of relevant knowledge, participants are more likely to rely on peripheral cues to make judgments (Petty & Cacioppo, 1986). Visual cues (such as colour) are more effective when individuals devote fewer resources to processing (Broeder & Dormalen, 2021). It can be inferred that colour manipulation, as a possible external cue, should have a more significant impact under LPK conditions.

In contrast, participants in the HPK group were not theoretically suitable for testing H1. In HPK participants, any main effect of colour was unlikely to emerge and may even have been suppressed. Inclusion of the HPK data when testing H1 may cause noise and violate the hypothesis about the congruence of treatment effects. Brambor et al.(2006) pointed out that testing main effects without accounting for conditionality can lead to misleading conclusions. Therefore, models with interaction effects, focusing only on the LPK group, where peripheral processing is theoretically expected, may provide a more conceptually coherent test of colour processing.

Although limiting the analysis to the LPK group reduced the overall sample size, this subgroup was still appropriate and had sufficient power to test H1. The LPK sample included over 300 participants, comparable to the higher sample size (n=155) of the previous study by Lim et al. (2020), suggesting that the test was still sufficiently powered to assess the hypothesised effects of

colour on persuasion under low-knowledge conditions. It is important to note that although the LPK and HPK groups were subjected to a manipulation check, this check was not directly related to H1; H1 was primarily concerned with the effectiveness of the colour manipulation and had no direct interaction with the knowledge manipulation. This design strategy emphasises the correspondence with theoretical predictions and provides a more targeted analytical basis in evaluation.

6.2.2. Colour Blindness Samples

During the initial data cleanup, subjects who self-declared to be colour blind were excluded to ensure that the colour manipulation was discernible and psychologically effective for all valid samples. Considering that the primary manipulated variable of this study involves colour design, which is relatively sensitive to colour perception ability, individuals who may not be able to perceive colour differences correctly were excluded from the sample inclusion criteria.

It is worth noting that "colour blindness" covers many different types in medicine and perceptual psychology, the most common of which include red-green colour blindness (the inability to distinguish between red and green) and colour weakness (a reduced ability to discern colour details). This study adopted a broader definition and asked the subjects to self-assess based on their experience. Those who self-identified as having difficulty discerning colours in daily life, whether complete or partial (e.g., difficulty distinguishing subtle colour changes), were considered unsuitable for the colour manipulation task in this study and were excluded from the final analysis sample. This screening strategy helps to improve manipulation validity and avoid response errors or unsystematic variation due to perceptual limitations.

6.2.3. The result of colour on advertisement attitude and policy support

H1 holds that a green background can give people a more positive attitude and support towards the advertisement than a grey background. Turning first to advertisement attitude and the effect of poster colour on advertisement attitude, ANOVA and an independent sample t-test were conducted. The results showed no significant difference in advertisement attitude scores between the green posters ($M = 3.90$, $SD = 0.91$, $n = 147$) and the grey posters ($M = 3.91$, $SD = 0.98$, $n = 149$). $F(1, 294) = 0.09$, $p = 0.765$. The 95% confidence interval $[-0.24, 0.18]$ includes 0, and the effect size is also tiny (Cohen's $d \approx 0.03$), indicating that the colour of the poster has minimal influence on the participants' attitudes.

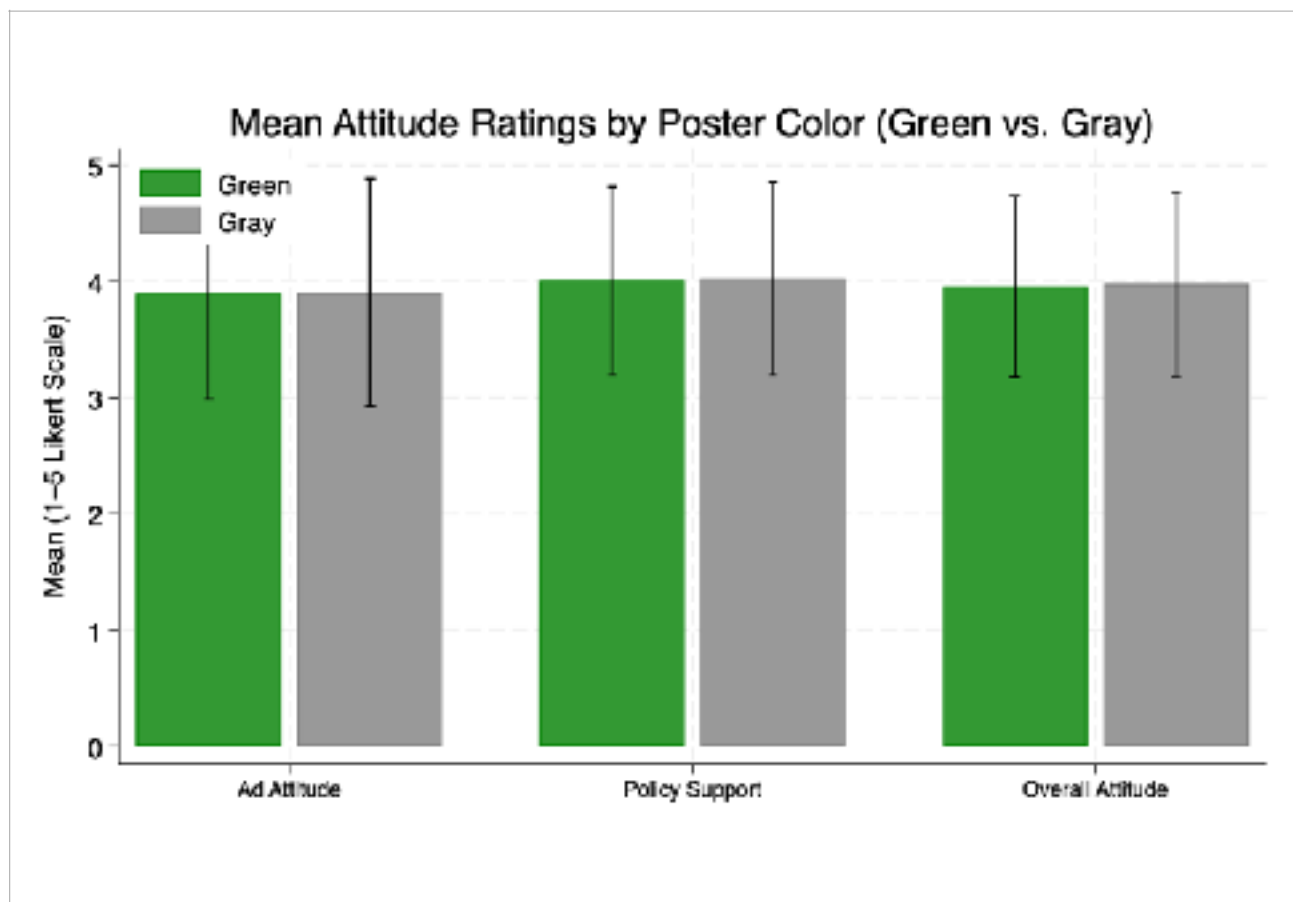
Next, I turn to policy support and conduct the same test. The results showed no significance in policy support between the green poster group ($M = 4.01$, $SD = 0.81$, $n = 145$). The grey poster group ($M = 4.03$, $SD = 0.83$, $n = 149$), $F(1, 292) = 0.04$, $p = 0.836$, indicates that the amount of explained variance is extremely low, indicating that poster colour has little effect on policy support. The 95% confidence interval $[-0.21, 0.17]$ suggests no effect.

The results of anova and t-test analysis showed that there was no significant difference in overall attitude between the green ($M = 3.96$, $SD = 0.78$, $n = 145$) and grey posters ($M = 3.98$, $SD = 0.79$, $n = 149$), $F(1, 292) = 0.06$, $p = 0.804$. The 95% confidence interval $[-0.20, 0.16]$ includes 0, and the effect size is also tiny (Cohen's $d \approx 0.01$). This result shows that, without distinguishing between the level of persuasion knowledge, the effect of poster colour on the subjects' overall advertisement attitude is not and substantively significant. Overall, colour has no significant impact on any of the three. H1 is not supported.

Table 9: Means and standard deviations for attitudinal outcomes by poster colour

| Variable | Poster Colour | N | M | SD |
|------------------------|---------------|-----|------|------|
| Advertisement Attitude | Green | 147 | 3.90 | 0.91 |
| | Grey | 149 | 3.91 | 0.98 |
| Policy Support | Green | 145 | 4.01 | 0.81 |
| | Grey | 149 | 4.03 | 0.83 |
| Overall Attitude | Green | 145 | 3.96 | 0.78 |
| | Grey | 149 | 3.98 | 0.79 |

Figure 4: Mean attitude ratings by poster colour



6.3 H2: Interaction between background colour and PK in shaping advertisement attitudes

H2 assumes an interaction between persuasion knowledge and advertisement background colour. Individuals with HPK will respond less positively to green-background environmental ads than LPK.

Although the study expected that background colour (green vs. grey) would affect advertisement attitudes and policy support (H1), the results showed that the colour manipulation did not lead to significant differences. This indicates that green does not increase the audience's positive attitudes toward environmental policy advertisements, and H1 is not supported.

Such results pose particular challenges to the examination of H2. Since H2 is based on the premise of H1, it will be difficult for the interaction between colour and persuasion knowledge to be significant if the manipulation fails to produce a main effect. Meanwhile, interaction effects require larger sample sizes and stronger manipulation strengths to be detected.

Furthermore, only some of the results of the test of the persuasion knowledge manipulation reached the marginal significance level, which may indicate that the manipulation might not be successful. Even if H1 is supported, the response differences between the HPK and LPK may be weakened if persuasion knowledge is not effectively differentiated. This might further weaken the likelihood of support for H2.

However, the researcher still chose to retain the analysis of H2 for two reasons. First, the theory still supports the idea that people with HPK may be suspicious and averse to strategic visual cues (such as green). Second, the sample size of this study is larger than that of the previous study by Lim et al. (2020) ($n=200$). If the effect exists, it should have a chance to be detected and to estimate the means with greater precision.

6.3.1 The result of interaction effect on colour and persuasion knowledge

To test the influence of H2 on advertisement attitude, this study used a regression model to test the interaction between background colour and PK group. The interaction between the two was not significant (Grey \times LPK: $b = 0.026$, $p = 0.875$), indicating that the green background did not create substantial negative attitudes in HPK. The analysis results show that the overall model is not significant ($F(3, 588) = 2.07$, $p = 0.104$), and the model explains minimal variance ($R^2 = 0.0104$). Display background colour (grey vs. green) itself has no significant effect on ad attitude ($p = 0.962$).

Comparison of the means of each group revealed that the overall score of the LPK group was higher than that of the HPK group. That is to say, regardless of the background colour, the LPK group had a more positive attitude toward the advertisement. In contrast, the HPK group had lower mean scores in both contexts. The main impact of the persuasion knowledge group also did not reach significance ($p = 0.103$), and the data showed that the influence of persuasion knowledge on advertisement attitude was greater than that of background colour. Although the direction aligns with expectations (HPK has a more negative attitude towards green), it is not significant.

Turning to policy support, the result shows that the main effect and interaction of poster colour were not significant (Grey vs. Green: $b = -0.028$, $p = 0.806$; Grey \times LPK: $b = 0.048$, $p = 0.748$), indicating that there was almost no difference between green and grey posters in the effects on

support intention in either in HPK or LPK. The overall model was significant ($F(3, 583) = 3.55, p = 0.0143$), explaining approximately 1.4% of the variance ($R^2 = 0.0143$). The effect of persuasion knowledge was close to significance ($b = +0.218, p = 0.035$), indicating that LPK were more willing to support the policy than HPK.

The data showed that the LPK group was more supportive than the HPK group on green and grey backgrounds. Still, the differences between different colours were minimal and not significant. The influence of persuasion knowledge is significantly greater than that of poster colour.

Lastly, the regression analysis showed that the overall model was significant ($F(3, 583) = 3.17, p = 0.0241$), but the explanatory power was very low ($R^2 = 0.0161$). The interaction term (Grey \times LPK) is not significant ($b = 0.0401, p = 0.783$), indicating no joint effect between persuasion knowledge and poster colour. Colour could not moderate the impact of persuasion knowledge on advertisement attitudes.

Regarding the effects of each variable, poster colour had no significant impact on overall attitude ($b = -.0171, p = 0.879$), indicating no substantial difference between green and grey backgrounds in advertisement attitude ratings. Persuasion knowledge was significant ($b = 0.2035, p = 0.046$), indicating that the LPK group had a more positive overall evaluation of the advertisement compared to the HPK group.

The overall trend shows that, regardless of the colour background, the LPK group has more positive attitudes and support, forming a stable difference with the HPK group. The difference between green and grey was minimal, indicating the lack of apparent persuasion effect of colour itself.

Overall, the key interaction between persuasion knowledge and poster colour was not significant in any models. Therefore, the results do not support H2. Although some main effects indicated that people with LPK tended to respond more positively to the ads, poster colour did not moderate this effect.

Table 10: Means and standard deviations for dependent variables by experimental group

| Group | Advertisement Attitude M (SD) | Policy Support M (SD) | Overall Attitude M(SD) |
|-------------|----------------------------------|--------------------------|---------------------------|
| LPK - Green | 3.90 (0.91) | 4.01 (0.81) | 3.96 (0.78) |
| LPK - Grey | 3.93 (0.91) | 4.03 (0.83) | 3.98 (0.79) |
| HPK - Green | 3.71 (1.07) | 3.79 (0.96) | 3.76 (0.96) |
| HPK - Grey | 3.72 (1.06) | 3.76 (0.99) | 3.74 (0.98) |
| Total | 3.82 (0.99) | 3.90 (0.90) | 3.86 (0.89) |

Table 11: Multiple linear regression predicting advertisement attitude

| Predictor | B | SE | t | p | 95% CI |
|---|--------|--------|-------|--------|-----------------|
| Poster Colour (Grey vs. Green) | 0.0058 | 0.124 | 0.05 | 0.962 | [-0.238, 0.249] |
| Persuasion Group (LPK vs. HPK) | 0.188 | 0.1153 | 1.63 | 0.103 | [-0.038, 0.414] |
| Poster Colour × Persuasion Group (Grey × LPK) | 0.0257 | 0.1627 | 0.16 | 0.875 | [-0.294, 0.345] |
| Constant (HPK-Green) | 3.7133 | 0.0878 | 42.31 | < .001 | [3.541, 3.886] |

Note. N = 592. $F(3, 588) = 2.07$, $p = .104$. $R^2 = .0104$.

Table 12: Regression results predicting policy support

| Variable | B | SE | t | p | 95% CI |
|---|---------|--------|-------|--------|-----------------|
| Poster Colour (Grey vs. Green) | -0.0281 | 0.1141 | -0.25 | 0.806 | [-0.252, 0.196] |
| Persuasion Group (LPK vs. HPK) | 0.2184 | 0.1034 | 2.11 | 0.035 | [0.015, 0.421] |
| Poster Colour × Persuasion Group (Grey × LPK) | 0.0479 | 0.1488 | 0.32 | 0.748 | [-0.244, 0.340] |
| Constant (HPK-Green) | 3.7919 | 0.0787 | 48.19 | < .001 | [3.637, 3.947] |

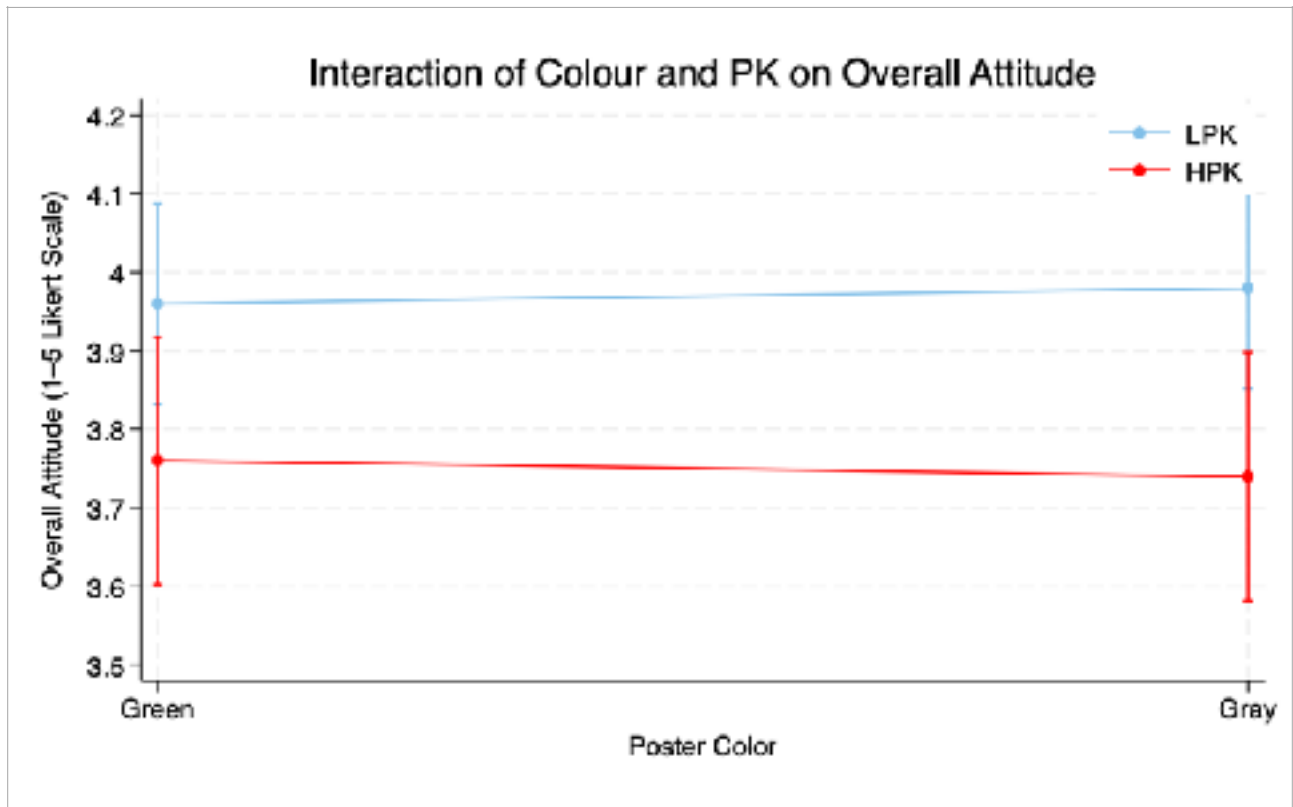
Note. N = 587. $F(3, 583) = 3.55$, $p = .014$. $R^2 = .0180$

Table 13: Regression results predicting overall attitude

| Variable | B | SE | t | p | 95% CI |
|---|---------|--------|-------|--------|-----------------|
| Poster Colour (Grey vs. Green) | -0.0172 | 0.1129 | -0.15 | 0.879 | [-0.239, 0.205] |
| Persuasion Group (LPK vs. HPK) | 0.2036 | 0.1018 | 2.0 | 0.046 | [0.004, 0.404] |
| Poster Colour × Persuasion Group (Grey × LPK) | 0.0401 | 0.1457 | 0.28 | 0.783 | [-0.246, 0.326] |
| Constant (HPK-Green) | 3.755 | 0.0783 | 47.96 | < .001 | [3.601, 3.909] |

Note. N = 587. $F(3, 583) = 3.17$, $p = .024$. $R^2 = .0161$

Figure 5: Interaction of colour and pk on overall attitude



7. Reflections and alternative explanations of nonsignificant results

Since the data in this study did not reach significance, it could not support the research hypothesis. This article will examine the potential factors behind the research results based on the seven alternative explanations (AES) proposed by Kane (2025) that may lead to non-significant experimental results.

7.1 Respondent inattentiveness

The analysis failed to support hypotheses H1 and H2. I re-examined the response quality and factors that may cause noise and conducted a more rigorous sample screening to ensure the validity and stability of the analysis. The following are the criteria for this re-screening.

First, the researcher screened the participants based on their time on the survey. Based on the pre-test and observations of the subjects' answering behaviour, the reasonable response time range is 4 to 25 minutes. A time that is too short may indicate careless participation, while a time that is too long may indicate unstable data. This range considers the average adult reading speed and the fact that older people may need longer processing time, and are more likely to retain a representative sample of those who answer questions thoughtfully.

Secondly, I also consider the attention test. A question about identifying the background colour of the poster was added to the survey to confirm whether the subjects noticed the visual stimulation. Subjects who failed to answer this question correctly were considered to have failed to receive the manipulation and were therefore excluded from the analysis.

359 responses were retained as valid analysis samples. This batch of responses has a higher quality of answers and processing congruence, which helps to eliminate potential noise and improve the sensitivity and internal validity of statistical tests. The analysis results ($n=359$) were similar to the previous results, which means that H1 and H2 could not be supported.

In the manipulation check, there was a significant main effect of poster colour on colour congruence ($b = -1.836$, $p < .001$), with the grey poster being rated as incongruent with the message. The PK manipulation showed no significant differences in intention levels between groups ($t(357) = 0.95$, $p = 0.345$). A two-tailed test of Sincerity was not substantial ($t(357) = -1.59$, $p = 0.112$). The one-tailed result approached marginal significance ($p = 0.056$).

For H1, there was no significant difference in advertisement attitude, policy support and overall attitude between green and grey backgrounds (advertisement attitude $t(183)=0.91$, $p= 0.365$; policy support $F(1,183)=0.02$, $p= 0.897$; overall attitude $F(1,183)=0.35$, $p= 0.557$). H1 was not supported.

For H2 (interaction effect), the main impact of poster colour and the interaction effect of colour \times PK were not significant (all $p > .70$), indicating that participants with different PK levels had no significant difference in response to the green background. PK has a stable and significant main effect on all three attitude indicators (advertisement attitude $\beta=0.311$, $p= 0.027$; policy support $\beta=0.293$, $p= 0.019$; overall attitude $\beta=0.302$, $p= 0.013$). Although the mean shows that the LPK-Green group has the highest attitude and the HPK-Grey group has the lowest attitude, it is not significant, so the interaction H2 cannot be supported.

Overall, the green background did not make the subjects feel more positive, nor did it significantly impact the attitudes of the different PK groups. For additional details, please refer to the appendix, which presents the complete analysis results.

7.2 Failure to vary the independent variable

The study designed two manipulation tests, targeting PK and colour congruence. The results showed that the colour manipulation check was successful, and the subjects generally believed that green was highly congruent with the environmental message, supporting that green is symbolic in visual design. However, the PK manipulation check did not reach significance, suggesting that the manipulation may not have stimulated participants' awareness of persuasion intent, highlighting the challenges of manipulating this variable.

This result indicates that PK may not have had the expected psychological impact. Though the PK effect was significant in the H2 analysis, this was insufficient to compensate for the potential risks caused by the non-significance of the manipulation test, especially when the manipulation test was designed to test whether the manipulation produced the corresponding psychological change. This result raises doubts about failed manipulations: Did we manipulate the variable we claimed to manipulate?

Furthermore, we must reflect on whether the order of manipulation checks may affect the research results. In this study, the PK manipulation check was placed before another manipulation (colour) and the primary dependent variables, which may have caused a "sequence effect". For example, LPK participants may be "reminded" to process the message with a higher level of scepticism after answering questions related to the manipulation check. This thereby deviates from the initially designed LPK state. If this order effect does exist, it will weaken the differences between the manipulations, further reducing the chances of detecting main or interaction effects.

Nevertheless, there are reasons to believe this potential interference does not fundamentally distort the results. First, in the analysis of H2, the PK main effect was significant. Even though the manipulation check was not significant, persuasion knowledge still showed a stable impact on the expected direction in the statistical analysis.

Furthermore, if the order effect tilted all subjects toward HPK, the colour manipulation check (placed after the information) should lose significance. However, both HPK and LPK groups rated green as more congruent with the environmental message than grey, and the regression coefficients of the two groups were almost the same. Suppose the order of manipulations turns everyone to HPK. In that case, we should observe that the green advantage disappears, or at least the coefficient shrinks significantly, but this is not the case. Therefore, the PK manipulation or the placement of its check questions may not undermine the effect of the colour manipulation at the perceptual level. For future research, using a pretest-treatment-posttest experimental approach can better explore the impact of treatment.

7.3 Pre-treated respondents

This study cannot directly establish whether the subjects have been exposed to similar research or environmental information. However, from the perspective of research design and sample source, several measures have been taken to reduce this risk. The samples were mainly obtained through the random distribution of online and physical recruiting. The subjects were diverse and widely

distributed (covering Asia and Europe). More importantly, the manipulation still triggered different responses. Even though participants may have seen similar advertisement designs or experiments before, they still rated the green background as matching the message. This shows that the colour cues were not completely weakened by their experience. Potential pre-treatment did not block the manipulation effect at the perceptual level.

Future research can further strengthen external validity by including relevant questions to reduce potential pre-treatment risks. For example, the subjects should be asked about their past relevant exposure experience to quantify the pre-treatment level. Or duplicate the experiment on different topics or colour combinations to see if the results are congruent in other contexts.

7.4 Insufficient statistical power

Based on the analysis, this study has sufficient reasons to exclude insufficient statistical power as the main reason for the non-significant results. Firstly, around 600 sample size is higher than the similar previous study by Lim et al., 2020 (n=200). In addition, past research regarding green manipulation has primarily focused on student samples in the United States, which are generally small in size and have limited representativeness and extrapolation validity (Huang & Lu, 2016; Seo & Scammon, 2017; Sundar & Kellaris, 2017; Ranaweera & Wasala, 2020). This study sample included subjects globally, predominantly Asian and European, with diverse demographics, such as gender, age, and education, providing higher power and external validity.

Secondly, if an insufficient sample size is the cause of a non-significant result, we should observe a significant effect after adjusting the sample size. However, the result of H1 was not substantial even after the sample size was doubled (LPK + HPK). This means that the non-significant results are not due to insufficient samples, but because the actual effect of the manipulated variable on the dependent variable is minimal. Furthermore, the Cohen's d of the H1 (green vs. grey) on the three main dependent variables all fall within the -0.0072 and 0.0004 range. This is also the case in the LPK subsample, where the effect should theoretically be most significant. Therefore, the non-significant result is more likely to reflect other factors than insufficient statistical power.

Finally, the scale's reliability showed a low possibility of measurement error, as all main dependent variables were two-item scales with Cronbach's α ranging from .765 to .896, eliminating the problem of underestimation of the effect due to measurement error.

Table 14: Effects of poster colour (green vs. grey) on advertisement attitude and policy support (n=587~592)

| Group / DV | Green M | Grey M | Green SD | Grey SD | F | p | R ² | t | Green-Grey) |
|------------------------------|---------|--------|----------|---------|------|--------|----------------|---------|-------------|
| LPK – Advertisement attitude | 3.8986 | 3.9418 | 0.9107 | 0.9069 | 0.16 | 0.6866 | 0.0006 | -0.4038 | -0.0432 |
| HPK – Advertisement attitude | 3.7172 | 3.7283 | 1.0830 | 1.0448 | 0.01 | 0.9307 | 0.0000 | -0.0870 | -0.0110 |
| LPK – Policy Support | 3.9970 | 4.0310 | 0.8040 | 0.8390 | 0.13 | 0.7229 | 0.0004 | -0.3549 | -0.0343 |
| HPK – Policy Support | 3.7970 | 3.7930 | 0.9640 | 0.9720 | 0.00 | 0.9787 | 0.0000 | 0.0267 | 0.0031 |

7.5 Poor measurement of the dependent variable and ceiling effects

The study used two-item subscales to measure three core dependent variables: advertisement attitude, policy support, and overall attitude. All scales passed the Cronbach's α test with reliabilities ranging from .765 to .896, showing good internal congruence. The subscale design also helps to reduce the random errors that may be caused by a single item and improve the overall measurement stability. In the regression models of H1 and H2, the p-value of the overall attitude is between advertisement attitude and policy support. This further confirms that question merging helps improve the stability and sensitivity of statistical tests, indicating that the combined overall scale has a more stable power.

The scale adopts a five-point Likert scale. Although it is slightly limited in capturing subtle changes compared to seven-point or finer scales, the data did not show obvious ceiling or floor effects. The means of the three main variables fall between 3.82 and 3.90, with standard deviations ranging from approximately 0.89 to 0.99, and the overall distribution shows moderate variation. Further observation of the response distribution showed that approximately 16%–24 % chose the highest score (5 points), while only 0.5%–2 % chose the lowest score (1 point), indicating that the subjects did not concentrate on extreme options. More importantly, the mean score differences between the LPK and HPK groups on several variables were approximately 0.3 to 0.4 points, indicating that even using a five-point scale, the differences between the groups were still detectable.

This study's dependent variable measurement tool is reliable and theoretically sufficient to capture effects. Even so, Cohen's d for the colour manipulation on the three attitude indicators only ranged from -0.0072 to 0.0004 , which suggests that the non-significant results are more likely to be due to the small size of the actual effect rather than measurement error or ceiling effects. Future research may consider using a seven-point Likert scale to improve the sensitivity of the measurement further and capture more subtle attitudinal differences.

Table 15: Descriptive statistics for key dependent variables (n = 587-592)

| Variable | N | M | SD | % Lowest | % Highest |
|------------------------|-----|------|------|----------|-----------|
| Advertisement Attitude | 592 | 3.82 | 0.99 | 2.03% | 23.65% |
| Policy Support | 587 | 3.90 | 0.91 | 0.68% | 24.19% |
| Overall Attitude | 587 | 3.86 | 0.89 | 0.51% | 16.18% |

7.6 Countervailing treatment effects

In this study, the green background, as a cue that symbolises environmental protection, may theoretically produce two opposite effects. On the one hand, it may enhance subjects' environmental connection with the advertisement, and create positive attitudes. On the other hand, green may also trigger suspicion, reducing trust in and support for advertisements or policies.

However, the results do not show the existence of such an offsetting phenomenon. First, the main effect of green background on colour congruence was very significant ($b = -1.489$, $p < .001$, Cohen's $d = 1.55$), indicating that the subjects generally believed that the green poster matches more with the environmental theme than the grey one. This shows that the positive mechanism has indeed been activated. Second, if a countervailing effect causes the offset, we should have observed significant negative responses to the green background in some groups. However, each group's average attitude scores of green and grey backgrounds are similar, and there is no evidence of adverse reactions.

Some argue that placing the PK manipulation check before the colour treatment and the dependent variable may cause the subjects to focus on the content of the message and thus ignore the hint of colour. However, the colour congruence effect is significant, indicating that the subjects still clearly perceive the existence and meaning of colour cues, refuting the claim that PK check questions cause subjects to ignore colour. In other words, even though the PK manipulation may have increased attention to the content of the message, partially shifting toward central processing pathways (Meyers-Levy & Peracchio, 1995), subjects still received and evaluated the colour cues. It was just that this perceptual enhancement did not translate further into attitudes or behavioural intentions.

Furthermore, the analysis found no specific group that behaves contrary to the overall trend. A more reasonable explanation is that although green improves the subjects' perception of the fit of the visual design, this effect mainly remains at the perceptual level and cannot effectively promote further evaluation or support behaviour. This may reflect that, in political issues, the peripheral clue caused by colour must pass through a higher level of cognitive filtering before it can affect attitude evaluations.

7.7 Extra discussion: other factors?

The researcher became further curious after H1 and H2 were not supported: Perhaps the colour did not directly change the subjects' attitudes, but indirectly affected the results through their feelings about whether the colour and the message matched. Intuitively, the subjects' feelings about colour-message congruence may play a key role. This process of "first affecting colour congruence and then affecting attitudes" is a mediation effect. The researcher conducted an exploratory analysis using structural equation modelling (SEM).

The results showed that the grey background significantly reduced the subjects' ratings of colour congruence ($b = -1.45$, $p < .001$), while the colour congruence stably predicted the three main dependent variables ($b = .21 \sim .28$, $p < .001$), showing a mediation effect.

The colour of the poster may not directly change the subjects' attitudes, but it affects their overall feelings about the advertisement and policy through colour-message congruence. Although this analysis is exploratory and the results may not lead to clear conclusions, it still reveals a path with theoretical potential, which will help future research further clarify the relationship between visual cues and persuasion effects. Please check appendix 10.3 for more details.

8. Limitations and conclusion

8.1 Research limitation: Limited range of colour stimulation

The experiment only manipulated two background colours (green and grey). According to Valdez and Mehrabian (1994), the brightness and saturation of colours generally increase people's pleasure. However, such colour combinations are rarely used in political advertisement and may not reflect actual usage contexts. Although this study attempted to simulate design styles in real environments using different combinations of brightness and saturation, this operation may also introduce additional perceptual variation and noise, thereby weakening the potential main effect. Therefore, future research can further systematically manipulate the brightness and saturation of green to assess its impact on attitudes and support intentions.

In addition, it is encouraged to combine green with other standard colours in politics for future studies. An exploratory analysis of "Select the colour that can best promote the environmental policy for the NGO" showed that a significantly higher proportion of HPK & Grey subjects abandoned green and switched to grey (6.5%) or beige (20.3%), the organisation's colour. This suggests that after recognising the propaganda intention, the subjects may look for the symbolic colour representing the organisation. Other identification clues fill the gap once the stimulus colour is neutral. For more information, please read Appendix 10.1.4.

In summary, to extend the combination of brightness and saturation, future research should include colours commonly used by political parties (such as blue, red, etc.) as experimental conditions to evaluate whether colours trigger deeper political identification and attitudinal responses. .

8.2 Final conclusion

This study explored the effects of colour and PK on people's advertisement attitudes and policy support. The results show that the background colour does not significantly affect attitude and support. First, H1 was not supported: advertisements with green backgrounds did not substantially increase the people's attitudes toward the advertisements or support the policy. H2 was not supported either: the interaction between PK and colour was not significant. The green background did not significantly reduce support in the HPK group. Although green backgrounds were generally considered more congruent with environmental messages in the manipulation check, this perceived positive evaluation did not transform into higher policy support or advertisement attitudes. PK is the key factor influencing attitudes: The LPK group showed more positive attitudes and support regardless of their background colour.

The results challenge theoretical claims about the broad influence of colour, particularly those suggesting that colour can profoundly affect attitudes and behaviours. Compared with the real situation, the experiment is simpler, and the participants are mostly highly educated and have better critical thinking (Lau, 2020). These factors may strengthen the experimental results, but do not reflect the effect of colour persuasion in real life.

The impact of colour manipulation may be limited to the perception level and is unlikely to drive downstream changes in attitudes and behaviours alone, at least in the political field. Interestingly, the results of this study are not congruent with the findings presented in previous studies.

Lim et al (2020) tested the theory in the business field and found that a green background can significantly improve consumers' attitudes towards advertisements and purchase intentions. Even though colour congruence was considered an essential mediating variable in the study, it was not included in the ANOVA analysis. The study's manipulation test (t-test) showed a significant difference between HPK and LPK. In addition, the study found that colour and persuasion knowledge had a significant interaction on advertisement attitude; the main effect of colour type was substantial, but the persuasion effect was not substantial (Lim et al., 2020). This also echoes that a replication experiment alone may not adequately measure research quality (Korbmacher et al., 2023).

Political persuasion involves not only the content of the message but also depends on peripheral cues such as colour, images, and layout. However, this study points out that visual symbols such as colour can attract attention and increase perceptual congruence; they cannot promote substantive attitudinal changes. This highlights that the influence of peripheral cues may be limited in the political field. Political content may require more resources to process the information, making people more inclined to process the message critically than colour (Meyers-Levy & Peracchio, 1995).

Future research can be extended in the following two directions. First, although people regard green and environmental messages as congruent, this perception does not transform into policy support. Future research could explore whether this phenomenon involves a gap in policy feasibility, cost, or fairness assessments. Second, the content intensity of persuasion messages should be further manipulated to explore whether PK interacts with message content. Perhaps testing how PK changes its effect when faced with strong vs. weak environmental messages. For example, if strong messages outweigh sceptical defence under HPK conditions.

In summary, this study shows that it is challenging to drive changes in attitudes and support by peripheral cues such as colour in political communication. This reminds us that in an environment where colour and visual communication are increasingly prevalent, policy marketers should focus more on the policy, rather than relying solely on superficial symbols for persuasion. It also reveals the differences in the involvement and message processing in political and business communications.

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10. Appendix

10.1. Subscale reliability, randomisation, and response patterns

10.1.1 Subscale reliability test

Subscale 1: Advertisement attitude

This scale combines "I feel favourable about the advertisement" and "This advertisement gives me a positive attitude". The Pearson correlation coefficient between the two questions was $r = .811$, which was significant ($p < .001$), indicating a high positive correlation and supporting the integration of the two questions into a single construct. The Cronbach's α test result was .896, and the average interitem covariance was .882, indicating that the subscale had excellent internal consistency.

Subscale 2: Policy support

This scale combines "I support the organisation's proposal", and "I would sign the petition for this organisation". The Pearson correlation coefficient between the two questions was $r = .648$ ($p < .001$), a moderate to high correlation. The Cronbach's α reliability was .765, and the average covariance was .630, indicating that this construct also had good internal congruence and was sufficient to measure policy support.

Subscale 3: Overall attitude

This study also integrated all four questions above to establish an overall attitude scale. Cross-facet correlation analysis showed a moderate positive correlation between advertisement attitude and policy support, for example, $r = .619$ between Q9 and Q11, and $r = .647$ between Q10 and Q12, which were significant. The Cronbach's α of the overall scale was .887, and the average covariance was .696, indicating that these four questions were highly internally consistent and suitable for combined analysis.

10.1.2 Randomisation check

Table 16: Chi-square test results for manipulated variables and background variables

| Variable | Poster Colour (p) | Persuasion Group (p) | PK \times Colour (p) |
|-----------|-------------------|----------------------|------------------------|
| Gender | 0.62 | 0.89 | 0.64 |
| Age | 0.13 | 0.74 | 0.12 |
| Education | 0.89 | 0.52 | 0.87 |
| Region | 0.30 | 0.22 | 0.27 |

Note: All p-values $>.05$, indicating no significant difference between experimental groups and background variables. Participants in the four groups are randomly distributed in terms of gender, age, education level, and regional distribution, supporting the success of random assignment.

10.1.3 Distribution of responses on likert scales for dependent variables

Table 17. Distribution of responses on likert scales for dependent variables

| Response | Q9 Freq (%) | Q10 Freq (%) | Q11 Freq (%) | Q12 Freq (%) |
|------------------------------|-------------|--------------|--------------|--------------|
| 1 Strongly disagree | 14 (2.36) | 17 (2.87) | 4 (0.68) | 27 (4.60) |
| 2 Somewhat disagree | 49 (8.28) | 66 (11.15) | 20 (3.41) | 74 (12.61) |
| 3 Neither disagree nor agree | 115 (19.43) | 130 (21.96) | 91 (15.50) | 136 (23.17) |
| 4 Somewhat agree | 213 (35.98) | 229 (38.68) | 245 (41.74) | 187 (31.86) |
| 5 Strongly agree | 201 (33.95) | 150 (25.34) | 227 (38.67) | 163 (27.77) |

Note: Q9 = I feel favourable about the advertisement. Q10 = This advertisement gives me a positive attitude. Q11 = I support the organisation's proposal. Q12 = I would sign the petition for this organisation.

10.1.4. Colour preference for promoting environmental messages by group

Table 18: Colour preference for promoting environmental messages by experimental group

| Group | Green Freq (%) | Grey Freq (%) | Beige Freq (%) | Total |
|-----------|----------------|---------------|----------------|-------|
| LPK-Green | 125 (86.21%) | 5 (3.45%) | 15 (10.34%) | 145 |
| LPK-Grey | 130 (87.25%) | 2 (1.34%) | 17 (11.41%) | 149 |
| HPK-Green | 129 (88.36%) | 5 (3.42%) | 12 (8.22%) | 146 |
| HPK-Grey | 101 (73.19%) | 9 (6.52%) | 28 (20.29%) | 138 |
| Total | 485 (83.91%) | 21 (3.63%) | 72 (12.46%) | 578 |

Note. Values represent observed frequency, with expected frequency in parentheses. Chi-square test: Pearson $\chi^2(6) = 17.4286$, Pr = 0.008; Likelihood-ratio $\chi^2(6) = 16.8159$, Pr = 0.010

10.2. Additional analysis with filtered data

Table 19: Multiple linear regression predicting colour congruence (n=359)

| Variable | B | SE | t | p | 95% CI |
|---|--------|-------|--------|-----------|------------------|
| Poster Colour (Grey vs. Green) | -1.836 | 0.140 | -13.11 | < .001*** | [-2.112, -1.561] |
| Persuasion Group (LPK vs. HPK) | 0.145 | 0.110 | 1.32 | 0.189 | [-0.072, 0.362] |
| Poster Colour × Persuasion Group (Grey × LPK) | 0.117 | 0.187 | 0.63 | 0.531 | [-0.250, 0.484] |
| Constant (HPK-Green) | 4.355 | 0.086 | 50.82 | < .001*** | [4.186, 4.523] |

Root MSE = .869. Robust standard errors reported. *p < .05, **p < .01, ***p < .001.

Table 20: Descriptive statistics for colour congruence by group (n=359)

| Group | Mean | Standard Deviation |
|-----------------|-------|--------------------|
| 1 (Green + HPK) | 4.500 | 0.681 |
| 2 (Grey + HPK) | 2.781 | 0.962 |
| 3 (Green + LPK) | 4.355 | 0.826 |
| 4 (Grey + LPK) | 2.519 | 0.998 |
| Total | 3.589 | 1.243 |

Table 21: T-test results for PK manipulation (n=359)

| Question | Group | N | Mean | Std. Err. | Std. Dev. | 95% CI | t | p (2-tailed) / (1-tailed) |
|-------------------------------|-------|-----|------|-----------|-----------|--------------|-------|---------------------------|
| Consider Volunteer Intentions | HPK | 174 | 3.86 | 0.075 | 0.99 | [3.71, 4.01] | 0.95 | 0.345 / 0.173 |
| | LPK | 185 | 3.75 | 0.089 | 1.21 | [3.58, 3.93] | — | — |
| Perceived Sincerity | HPK | 174 | 3.39 | 0.079 | 1.04 | [3.24, 3.55] | -1.59 | 0.112 / 0.056 |
| | LPK | 185 | 3.56 | 0.073 | 1.00 | [3.42, 3.71] | — | — |

H1: Colour effects among LPK participants

Advertisement attitude

An independent samples t-test indicated that there was no significant difference in advertisement attitudes between the green ($M = 4.04$, $SD = 0.82$) and grey poster conditions ($M = 3.92$, $SD = 0.90$), $t(183) = 0.91$, $p = 0.365$. The 95% confidence interval $[-0.135, 0.365]$ includes zero, indicating that the difference is not significant.

Policy support

In the LPK group, one-way ANOVA showed that poster colour had no significant effect on policy support, $F(1, 183) = 0.02$, $p = 0.897$, and the explained variance was very low ($R^2 = .0001$). An independent samples t-test also showed no significant difference between the green ($M = 4.10$, $SD = 0.76$) and grey posters ($M = 4.08$, $SD = 0.78$), $t(183) = 0.13$, $p = 0.897$.

Overall attitude

In the LPK group, one-way ANOVA showed that poster colour had no significant effect on overall attitude, $F(1, 183) = 0.35$, $p = 0.557$, and the explained variance was very low ($R^2 = .0019$). The results of the independent sample t-test were also not significant. There was no significant difference between the green poster ($M = 4.07$, $SD = 0.72$) and the grey poster ($M = 4.00$, $SD = 0.78$), $t(183) = 0.59$, $p = 0.557$. This suggests that in the LPK condition, poster colour did not significantly affect overall attitude evaluations.

Table 22: Means and standard deviations for attitudinal outcomes by poster colour ($n=185$)

| Measure | Poster Colour | n | M | SD |
|------------------------|---------------|----|------|------|
| Advertisement Attitude | Green | 96 | 4.04 | 0.82 |
| | Grey | 89 | 3.92 | 0.90 |
| Policy Support | Green | 96 | 4.10 | 0.76 |
| | Grey | 89 | 4.08 | 0.78 |
| Overall Attitude | Green | 96 | 4.07 | 0.72 |
| | Grey | 89 | 4.00 | 0.78 |

H2: Interaction between background colour and persuasion knowledge in shaping advertisement attitudes

Table 23: Means and standard deviations for dependent variables by experimental group (n=359)

| Group | Advertisement Attitude | Policy Support M (SD) | Overall Attitude M(SD) | Overall Attitude SD |
|-------------|------------------------|-----------------------|------------------------|---------------------|
| LPK - Green | 4.04 (0.82) | 4.10 (0.76) | 4.07 (0.72) | 0.72 |
| LPK - Grey | 3.92 (0.90) | 4.08 (0.78) | 4.00 (0.78) | 0.78 |
| HPK - Green | 3.73 (1.07) | 3.81 (0.93) | 3.77 (0.92) | 0.92 |
| HPK - Grey | 3.69 (1.11) | 3.76 (1.06) | 3.73 (1.04) | 1.04 |
| Total | 3.85 (0.99) | 3.94 (0.90) | 3.90 (0.88) | 0.88 |

Table 24: Multiple linear regression predicting overall attitude (n=359)

| Predictor | B | t | p | 95% CI |
|------------------------------------|--------|-------|-------|-----------------|
| Poster Colour (Grey vs. Green) | -0.041 | -0.27 | 0.785 | [-0.343, 0.261] |
| Persuasion Knowledge (LPK vs. HPK) | 0.302 | 2.50 | .013* | [0.063, 0.540] |
| Interaction (Grey × LPK) | -0.024 | -0.13 | 0.897 | [-0.405, 0.356] |

Note. N = 359. $F(3, 355) = 3.45$, $p = .017^*$, $R^2 = .0283$. * $p < .05$.

Table 25: Regression analysis predicting advertisement attitude (n=359)

| Predictor | B | SE | t | p | 95% CI |
|------------------------------------|--------|-------|-------|-----------|-----------------|
| Poster Colour (Grey vs. Green) | -0.034 | 0.166 | -0.21 | 0.836 | [-0.361, 0.293] |
| Persuasion Knowledge (LPK vs. HPK) | 0.311 | 0.140 | 2.22 | .027* | [0.036, 0.585] |
| Interaction (Grey × LPK) | -0.081 | 0.209 | -0.39 | 0.700 | [-0.492, 0.331] |
| Constant (Green × HPK) | 3.726 | 0.111 | 33.43 | < .001*** | [3.507, 3.945] |

Note. N = 359. $F(3, 355) = 2.63$, $p = .0501$, $R^2 = .0209$, Root MSE = .980.

Table 26: Regression analysis predicting policy support (n=359)

| Predictor | B | SE | t | p | 95% CI |
|------------------------------------|--------|-------|-------|-----------|-----------------|
| Poster Colour (Grey vs. Green) | -0.047 | 0.152 | -0.31 | 0.756 | [-0.346, 0.252] |
| Persuasion Knowledge (LPK vs. HPK) | 0.293 | 0.124 | 2.36 | .019* | [0.048, 0.537] |
| Interaction (Grey × LPK) | 0.033 | 0.190 | 0.17 | 0.864 | [-0.341, 0.406] |
| Constant (Green × HPK) | 3.806 | 0.097 | 39.35 | < .001*** | [3.616, 3.997] |

Note. N = 359. $F(3, 355) = 3.56$, $p = .0145^*$, $R^2 = .0299$, Root MSE = .886. * $p < .05$, *** $p < .001$

10.3. Structural equation modelling (SEM) analysis

SEM analysis showed that colour congruence played a mediating role in this study. The grey background significantly reduces the subjects' evaluation of colour congruence ($b = -1.45$, $p < .001$), while colour congruence predicts three main attitude variables, including policy support, advertisement attitude and overall attitude ($b = .21 \sim .28$, $p < .001$). This path pattern clearly shows that as long as the subjects subjectively believe that the colour of the poster is congruent with the message content, their evaluation of the advertisement and policy will improve simultaneously.

Even more revealing is the flip of the direct effect. After controlling for colour congruence, the grey background turned significantly positive for policy support ($\beta = +0.310$, $p < .001$) and advertisement attitude ($\beta = +0.432$, $p < .001$). Grey may also trigger additional associations such as rationality and neutrality, and this path is masked when colour congruence is not incorporated.

The results challenge the linear model of colour-persuasion. This may also explain why this study failed to produce significant main effect results like previous studies in the business field. Regarding political issues, audiences tend to make judgments based on the congruence of meaning and rational explanations, rather than direct attitudinal responses based solely on visual cues. This also shows that the theoretical effectiveness of colour influence may only be limited to the perceptual level; to transform it into persuasion results, other factors must be combined.

Table 27: Structural equation model predicting colour congruence and policy support (n = 583)

| Endogenous Variable | Predictor | B | SE | z | p | 95% CI |
|---------------------|-------------------|--------|-------|--------|-----------|----------------|
| Colour Congruence | Grey (vs. Green) | -1.452 | 0.078 | -18.69 | < .001*** | [-1.60, -1.30] |
| | LPK (vs. HPK) | 0.134 | 0.078 | 1.73 | 0.083 | [-0.02, 0.29] |
| | Constant | 4.327 | 0.060 | 72.46 | < .001*** | [4.209, 4.443] |
| Policy Support | Colour Congruence | 0.214 | 0.040 | 5.33 | < .001*** | [0.14, 0.29] |
| | Grey (vs. Green) | 0.310 | 0.088 | 3.50 | < .001*** | [0.14, 0.48] |
| | LPK (vs. HPK) | 0.205 | 0.073 | 2.81 | .005** | [0.06, 0.35] |
| | Constant | 2.863 | 0.190 | 15.06 | < .001*** | [2.49, 3.24] |

Note. Grey and LPK are dummy-coded (1 = Grey or LPK; 0 = Green or HPK). *p < .05, **p < .01, ***p < .001.

Table 28: Structural equation model predicting colour congruence and advertisement attitude (n = 583)

| Endogenous Variable | Predictor | B | SE | z | p | 95% CI |
|------------------------|-------------------|--------|-------|--------|-----------|----------------|
| Colour Congruence | Grey (vs. Green) | -1.452 | 0.078 | -18.69 | < .001*** | [-1.60, -1.30] |
| | LPK (vs. HPK) | 0.134 | 0.078 | 1.73 | 0.083 | [-0.02, 0.29] |
| | Constant | 4.326 | 0.060 | 72.46 | < .001*** | [4.21, 4.44] |
| Advertisement Attitude | Colour Congruence | 0.287 | 0.044 | 6.45 | < .001*** | [0.20, 0.37] |
| | Grey (vs. Green) | 0.432 | 0.098 | 4.42 | < .001*** | [0.24, 0.62] |
| | LPK (vs. HPK) | 0.156 | 0.079 | 1.99 | .047* | [0.00, 0.31] |
| | Constant | 2.475 | 0.210 | 11.78 | < .001*** | [2.06, 2.89] |

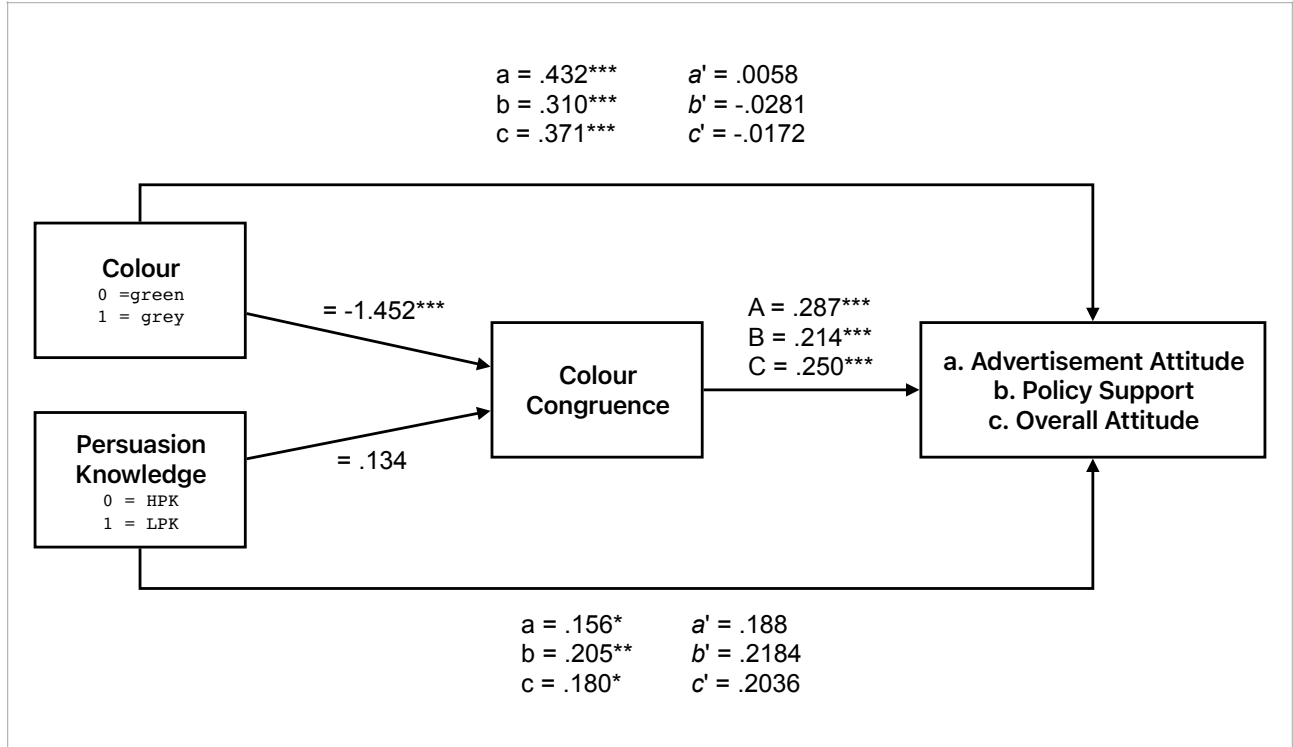
Note. Grey and LPK are dummy-coded (1 = Grey or LPK; 0 = Green or HPK). *p < .05, **p < .01, ***p < .001.

Table 29: Structural equation model predicting colour congruence and overall attitude (n = 583)

| Endogenous Variable | Predictor | B | SE | z | p | 95% CI |
|---------------------|-------------------|--------|-------|--------|-----------|----------------|
| Colour Congruence | Grey (vs. Green) | -1.452 | 0.078 | -18.69 | < .001*** | [-1.60, -1.30] |
| | LPK (vs. HPK) | 0.134 | 0.078 | 1.73 | 0.083 | [-0.02, 0.29] |
| | Constant | 4.326 | 0.060 | 72.46 | < .001*** | [4.21, 4.44] |
| Overall Attitude | Colour Congruence | 0.250 | 0.039 | 6.50 | < .001*** | [0.17, 0.33] |
| | Grey (vs. Green) | 0.371 | 0.083 | 4.46 | < .001*** | [0.21, 0.53] |
| | LPK (vs. HPK) | 0.180 | 0.070 | 2.57 | .010* | [0.04, 0.32] |
| | Constant | 2.669 | 0.181 | 14.76 | < .001*** | [2.31, 3.02] |

Note. Grey and LPK are dummy-coded (1 = Grey or LPK; 0 = Green or HPK). *p < .05, **p < .01, ***p < .001.

Figure 6: Effects of colour and persuasion knowledge on dependent variables through colour congruence.



10.4. Experimental posters and stimuli

10.4.1 Colour treatment instructions and treatment

Instruction:

Imagine you're browsing internet and a advertisement pops out. You will see an online advertisement from an organisation (Gothenburg for Future, GoF) as a part of their campaign to sign a petition for environmental reforms.

Please read the advertisement below and answer the questions.



Text on the poster:

Together we make a difference!

Your Action Determines Future Environment

Gothenburg for Future has been fighting for environmental progress for decades—promoting green policies, protecting nature, and ensuring a better future for younger generations

Our Proposal:

- Promote cheaper public transportation to reduce emissions
- Expand bike lanes and pedestrian-friendly areas
- More investment on green transportation such as railways

Now, we need your support! We're petitioning the government for stronger environmental policies—your signature makes a difference!

10.4.2 Persuasion knowledge treatment

LPK instruction:

You will read a scenario involving a fundraising event. When reading the scenario, you should imagine yourself as a visitor interacting with a volunteer as you consider donating money to support their projects.

As you read, *please take a minute to think about what is most important to you when making a donation.* Think about the considerations you might have when donating money to charity or NGOs.

HPK instruction:

You will read a scenario involving a fundraising event. When reading the scenario, you should imagine yourself as a visitor interacting with a volunteer as you consider donating money to support their projects.

As you read, *please take a minute to think about the volunteer's communication.* Think about the considerations that might have led the volunteer to communicate this way. Keep in mind that some people try to truthfully communicate information about projects and promotions, while others might try to trick or mislead the public.

Scenario (all groups):

Imagine you've gone to an NGO's fundraising event to donate money to help children in developing countries.

After looking through the brochure, you narrow it down to two projects. The first one provides new books for schoolchildren, immediately catching your interest since you've been passionate about education. The second one focuses on renovating a school library, which also supports education but requires a significantly larger donation than the first.

You pause to consider your options. As you flip through the details of the library renovation project, the volunteer Pernilla smiles and says to you, "This is such an important initiative - better for someone like you, who values making a real impact in the world." Finally, you decide to contribute to the more expensive library renovation project. Imagine that you take out your credit card and complete the donation. Pernilla, the volunteer, processes the payment. You take the receipt and leave.

10.4.3 Example of a web survey link

Got 5 minutes?

Help us understand public opinions on current affairs!

I'm conducting a survey for my master's thesis in Political Science at the University of Gothenburg. The survey is completely anonymous and takes just 5 minutes to complete.

It's available in English, Swedish, and Mandarin Chinese—if you're 18 or older, I'd love to hear your thoughts!

https://samgu.eu.qualtrics.com/jfe/form/SV_6X09h1h7Drj0OLY

Feel free to share this message with your friends—I truly appreciate your help!

Thank you!

Chia-Hsun Tsai

DO YOU HAVE 5 MINUTES TO SPARE?

Take part in my survey on public
opinions about current affairs!



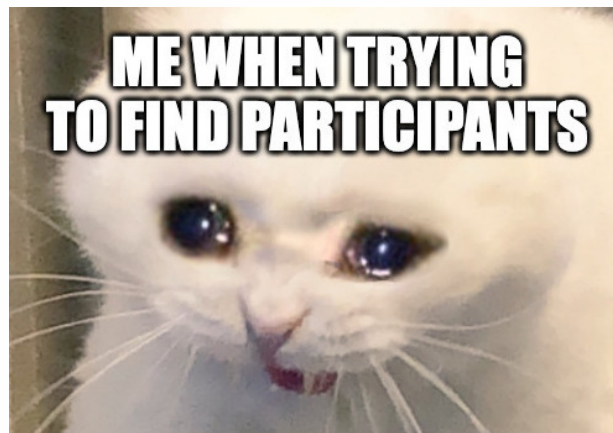
For my master's thesis, I'm studying how
people perceive public opinions on
current events. The survey is anonymous,
easy to complete, and takes around 5
minutes. If you're over 18, I'd love to hear
your thoughts!



10.4.4 Example of a survey channel with a QR code attached to a physical poster

HAR DU 5 MINUTER ÖVER?

HJÄLP OSS FÖRSTÅ FOLKS ÅSIKTER OM AKTUELLA HÄNDELSER!
HELP US UNDERSTAND PEOPLE'S OPINIONS ON CURRENT AFFAIRS!



DIN HJÄLP ÄR AVGÖRANDE!

Hej! Jag söker deltagare till en undersökning om allmänhetens åsikter om aktuella händelser. Undersökningen är en del av min masteruppsats i statsvetenskap vid Göteborgs universitet. Enkäten är helt anonym och tar cirka 5 minuter att genomföra. Alla som är över 18 kan delta i undersökningen.

Hej! I'm looking for participants in a survey about Public Opinions on Current Affairs. The survey is part of my master's thesis in Political Science at the University of Gothenburg. The survey is completely anonymous and takes about 5 minutes to complete. Anyone over 18 can participate in the survey.

**OBS: THE SURVEY IS AVAILABLE
IN ENGLISH AND SWEDISH.**



Skanna QR-koden
för att fylla i enkäten!

Contact:

Name: Chia-Hsun Tsai

Masterprogram i statsvetenskap: Politik och psykologi om hållbar utveckling (MapsE)

Email: gustsaich@student.gu.se

FIKA & FEEDBACK!



**Fyll i enkäten, ta några
kakor!**

**Fill out the survey and take
some cookies!**



10.5. Survey codebook

Note: the values in Q4~5, Q9~14 are later reversed when analysing.

| Question number | Question | Coding |
|-----------------|--|--|
| 1 | Introduction, GDPR, consent | agree = 4 |
| 2~3 | PK Instruction + treatment (Please refer 10.4.2 Persuasion knowledge treatment for detailed information) | |
| 4 | Do you agree or disagree with the following statements? I consider the volunteer's intentions a lot while reading the scenario. | Strongly agree = 1 Somewhat agree = 2 Neither disagree nor agree = 3 Somewhat disagree = 4 Strongly disagree = 5 |
| 5 | I feel that the volunteer was sincere in the scenario. | Strongly agree = 1 Somewhat agree = 2 Neither disagree nor agree = 3 Somewhat disagree = 4 Strongly disagree = 5 |
| 6~8 | Colour Instruction + Treatment (Please refer 10.4.1 Colour treatment instructions and treatment for more information) | |
| 9 | Do you agree or disagree with the following statements? I feel favourable about the advertisement. | Strongly agree = 1 Somewhat agree = 2 Neither disagree nor agree = 3 Somewhat disagree = 4 Strongly disagree = 5 |
| 10 | This advertisement gives me are positive attitude. | Strongly agree = 1 Somewhat agree = 2 Neither disagree nor agree = 3 Somewhat disagree = 4 Strongly disagree = 5 |
| 11 | I support the organisation's proposal. | Strongly agree = 1 Somewhat agree = 2 Neither disagree nor agree = 3 Somewhat disagree = 4 Strongly disagree = 5 |

| | | |
|----|--|--|
| 12 | I would sign the petition for this organisation. | Strongly agree = 1 Somewhat agree = 2 Neither disagree nor agree = 3 Somewhat disagree = 4 Strongly disagree = 5 |
| 13 | The colour I saw in this advertisement matches the message. | Strongly agree = 1 Somewhat agree = 2 Neither disagree nor agree = 3 Somewhat disagree = 4 Strongly disagree = 5 |
| 14 | The colour I saw in this advertisement is relevant to the message. | Strongly agree = 1 Somewhat agree = 2 Neither disagree nor agree = 3 Somewhat disagree = 4 Strongly disagree = 5 |
| 15 | The colour I saw in this advertisement is relevant to the message. | Green = 1 Grey = 2 |
| 16 | Imagine you are a member of Gothenburg for Future. In a meeting, you have to vote on which colour will best attract the public to sign for the petition campaign. Which colour would you choose? | Green = 1 Grey = 2 Beige = 3 |



| | | |
|----|---------------------------------|-------------------------------------|
| 17 | Instruction: move to demography | |
| 18 | What is your gender? | Male = 1 Female = 2 Other = 3 |

| | | |
|---------------|---|--|
| 19 | What is your age? | 16–19 = 1 20–24 = 2 25–29 = 3 30–39 = 4 40–49 = 5 50–59 = 6 60–75 = 7 76–90 = 8 |
| 20 | What is your highest level of education? | Elementary school or equivalent = 1 High school or equivalent = 2 Post-secondary education, not college = 3 University or College = 4 Postgraduate education = 5 |
| 21 | Do you have colour blindness? | No = 1 Yes = 2 |
| 22 | Which country do you live at the moment? | (filled in by participants) |
| 23 | Where are you born? | Asia = 1 Africa = 2 Europe = 3 Oceania = 4 America = 5 |
| 24 | What do you think of your English ability ? | Basic (beginner/ elementary) = 1 Intermediate (conversational) = 2 Advanced (proficient) = 3 Mother language (or professional) = 4 |
| 25 | Finally, a basic math question: If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? | 100 min = 1 50 min = 2 5 min = 3 |
| End of survey | | |