To plant a seed is to believe in tomorrow.

An experimental study on the impact of subliminal- and supraliminal priming on attitude, generativity, purchase intention and product choice with regard to green behaviour.

UNIVERSITY OF TWENTE.

Researcher

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Master Thesis

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An experimental study on the impact of subliminal- and supraliminal priming on attitude, generativity, purchase intention and product choice with regard to green behaviour.

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Abstract

Aim. The purpose of this study is to investigate to what extent subliminal- and supraliminal priming positively affect attitude, generativity, purchase intention and product choice regarding green behaviour. This study is aimed at exploring whether people can be supported in making product choices that support green behaviour.

Methods. A 2 (subliminal priming: absent vs. present) x 2(supraliminal priming: absent vs. present) experimental research has been conducted. The potential interaction effect between subliminal- and supraliminal priming has been studied, as well as the moderating variables subjective norms and perceived behavioural control regarding green behaviour. The participants (N = 239) were randomly assigned to one of four conditions. After the manipulation, participants were exposed to a measurement where product choices had to be made and questions on attitude, generativity purchase intention, subjective norms and perceived behavioural control was completed.

Results. The analysis of results showed a significant effect of supraliminal priming on the dependent variables. A marginal interaction effect was found too. A significant effect of supraliminal priming and an interaction effect on product choice was found. An interaction effect on purchase intention was found, a marginal interaction effect and a supraliminal priming effect. Analysis of descriptive statistics supported the supraliminal priming effect on the dependent variables. It led to a promising pattern of positive effects of priming on the dependent variables.

Conclusion. The results were in line with expectations based on prior research, which showed positive effects of supraliminal priming on product choice, attitude and purchase intention. This study offers various practical and theoretical implications and insights which are valuable for future research. Questions were raised whether priming could be used in other contexts and if the effects of priming would be significant in other contexts. The outcomes of this study could benefit future research, as this study offers insight in the opportunities of priming in video content.

Keywords: Priming, subliminal priming, supraliminal priming, green behaviour

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1. Introduction

1.1 Green behaviour

Water pollution and global warming are examples of various sustainability problems that are a threat to the world. A lot of research with regards to green consumer behaviour is done due to the increasing awareness and importance of the environment (Schuuring, 2018). A lot of studies have been investigating the motivations and attitudes that can lead to the purchase of green behaviour. Most studies show that the attitudes of consumers towards green consumption are positive (Joshi & Rahman, 2015) (Barbossa & Pastore, 2015). It is interesting that positive attitudes do not necessarily lead to green behaviour, while climate change is affecting every country on every continent. National economies are being disrupted and lives are affected. The weather patterns are changing, sea levels are rising, and the weather conditions are becoming more extreme. Without action towards these climate changes the United Nations state that "the world's average surface temperature is likely to increase 3 degrees centigrade this century. The poorest and most vulnerable people are being affected the most." (United Nations, 2020) Goal 13 of the United Nations is focused on raising awareness, improving education, human and institutional capacity on climate change and to take urgent action to combat climate change and its impacts. One of the goals is integrating climate change measures into national policies, strategies and planning. Another goal is to promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, including focusing on women, youth and local and marginalized communities. The goal of the research will be to raise awareness, increase knowledge and positively influence attitudes of people with regard to green behaviour.

1.1.2 Green behaviour in the Netherlands.

There is a perception that the Netherlands is one of the world leaders regarding sustainability. The reality is that Dutch consumers lag behind citizens of other nations when it comes to sustainable shopping. According to PwC (2019) 28% of Dutch consumers are looking for products with environmentally friendly packaging, worldwide this group is 37%. Looking at sustainable products to support the environment, 27% of Dutch consumers said they prioritise sustainable products, worldwide, this is 35%. It was measured that 23% of Dutch respondents stated to buy brands that support sustainable practises, this is globally 29%. Dutch consumers are also less willing to pay more for sustainability. It was interesting to see that the higher the salaries are, the less interested Dutch are in sustainability. Statistics of CBS (2017) show that 42% of Dutch consumers claim to have the intention of purchasing sustainable products, while statistics show that only 10% of the Dutch consumers buy sustainable products.

1.2 Online video content

In response to climate change and global environmental problems, policymakers are becoming more interested in encouraging people to adopt more sustainable behaviours. The United Kingdom was first to introduce a long-term framework for mitigation and adoption under the 2008 Climate Change Act. Nowadays, the use of online platforms to watch videos is strongly increasing. The age group 16-34 are the largest group of consumers regarding online videos. It is important for the younger generation to become aware of the problem and to influence them in making "ethical choices" during their lifetime. Online videos platforms are rapidly growing platforms, is growing rapidly among the younger population. Therefore, 87% of online marketeers are using video content (Outbrain, 2021). Twitch is a broadcasting medium which had a monthly average of 3.64 million broadcasters over 2019. Twitch is becoming more popular, the platform was launched in 2011, there has been an increase in the number of viewers using the platform. In October 2013 there were 45 million unique visitors. The traffic continued to grow to 100 million monthly viewers in 2015 and 15 million daily viewers in 2018 (Iqbal, 2020). GlobalWebIndex did research on the audience of the users of twitch. It was found that 73% of the twitch users are in the age group 16-34. This platform is used for example for companies to broadcast their trailers to gain interest of the target audience towards their game. The age group of 16-34 are also increasingly watching videos on platforms such as YouTube (Statista, 2021). It is interesting to investigate whether people can be influenced in watching a video by their interest. Therefore, it will be tested if the age group of 16-34 years could be influenced by the use of priming. For the video content, a gaming video will be used.

1.3 Priming

Behaviour of people can be influenced using priming. Priming refers to an increased sensitivity to a stimulus, it results from prior exposure to a related visual or audio message (Barutchu, Spence, & Humphreys, 2018). Two types of priming are subliminal and supraliminal priming. A subliminal prime is a message which is hidden in a medium and has the intention to be exposed without being consciously noticed. The subliminal messages will still be processed by the unconsciousness and incite unnoticed to a certain behaviour. Subliminal priming does occur when a person is exposed to stimuli below the threshold of perception (Elgendi, et al., 2018). Supraliminal priming is aimed at influencing behaviour unconsciously. Supraliminal primes are stimuli above the threshold of perception, but people are not aware of these primes (Elgendi, et al., 2018).

Elgendi et al. (2018) stated that subliminal priming does occur when the stimulus is less than 500 milliseconds (ms), this is the threshold of perception. When a stimulus has a duration greater than 500ms, the prime is a supraliminal prime. This means that the prime can be perceived by the conscious mind. Various studies challenged the threshold of perception of 500ms. For instance, during the presidential elections of the United States of America, there was an advertisement which had a subliminal prime with the word RATS. The word RATS was flashed quickly through the screen (300ms), but the prime was discovered because various people noticed it. When the viewers discovered the prime, they were curious if the subliminal prime was used by purpose and if it had an effect. Two experiments were carried out by Weinberger & Westen (2008) to study the effects of the subliminal prime and the way politicians were evaluated. It was proved that subliminal primes can affect ratings of politicians, as it can be concluded that showing the word RATS had a negative effect on the evaluation of politicians. Most studies that are aimed at studying the effects of subliminal priming are using a duration around 30 to 40ms for their subliminal primes (Cooper & Cooper, 2002; Sato, Kochiyama, Minemoto, Sawada, & Fushiki, 2019; Kam, 2007). It was concluded by different studies that there is an effect of subliminal priming in video content (Brinkman, Wiggers, & Heynderickx, 2013). The different studies that were conducted did focus on different aspects. Nowadays there has been done no research if subliminal- and supraliminal have an effect on green behaviour.

1.4 Priming to improve green behaviour

Within this research, the potential effects of subliminal- and supraliminal priming on purchase intention, product choice, attitude and generativity regarding green behaviour will be studied. Generativity is the ability to transcend personal interest to provide care and concern for future generations (Hutchison & Elizabeth, 2010). It will be measured whether priming can influence the degree of generativity.

This study will be carried out to support people in making ethical product choices to support green behaviour, the target group of Dutch people between 18 and 34 years old are deemed interesting. For this study a video content had to be chosen, for this study a video related to games will be used. Participants of the research will be exposed to primes through such content. To test the potential effects, a between-subjects research design will be used. A 2 (subliminal priming: absent vs. present) x 2 (supraliminal priming: absent vs. present) experimental research design will be tested. It will also be investigated whether combining the two types of priming will strengthen the effects.

The following research questions were formulated and will be central to this study:

To what extent can subliminal- and/or supraliminal priming affect attitude, generativity, purchase intention and product choice with regard to the green behaviour?

To what extent do subjective norms and perceived behavioural control regarding green behaviour affect the strength of priming effects?

2. Theoretical Framework

In the following section, human behaviour will be explained, the impact of attitudes, perceived behavioural control, subjective norms regarding green behaviour will be described. Furthermore, the concept of green behaviour, generativity surrounding priming are given. Thereafter, an overview of previous research on subliminal- and supraliminal priming is given. Lastly, the research model central to this study will be presented. First the moderating hypothesises will be introduced, thereafter, the main hypothesises of this study will be introduced.

2.1 Human behaviour explained

Humans are diverse in their knowledge and abilities and are controlled by rational decision making and emotional behaviour. There are different theories on explaining human behaviour (Kennedy, 2011). One of these theories is the theory of planned behaviour. The theory of planned behaviour is used to investigate the behaviour of consumers. The TPB is derived from the Theory of Reasoned Action and this theory is added with perceived behavioural control, attitude and subjective norm as a predictor for the intention of a behaviour (Daiton & Zelley, 2015). The TPB does provide a good understanding of the factors that are affecting the behaviour of an individual in different situations (Azjen, 1991). The model is based on three factors: the attitude, the subjective norms, and the perceived behavioural control. These factors form the base of the intention of a consumer to perform a certain behaviour.

2.1.1 Attitude

Attitude is defined by Azjen (1991) as "the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question." In this research, the attitude will consist of the construct of the participants towards green behaviour. It is reported that environmental concern influences the attitude of people towards the eco-friendly products and service (Yadav & Pathak, 2016). The debates about climate change are symbolized by an excessive amount of uncertainty (Zehr, 2000). Ethical attitude is defined as an approach for something that is pertaining to morality or right or wrong in conduct. It is found that gender correlates with the perception of what the ethical climate should be. It was shown that females show significantly more favourable attitude towards ethical behaviour than men (Luthar, DiBattista, & Gautschi, 1997). A significant barrier to the public engagement is scepticism in attitudes of the public towards climate change. People with opposing attitudes often comprehend the evidence in such a way that is biased towards their current attitude, this can lead to attitude polarisation (Corner, Whitmarsh, & Xenias, 2012). It is deemed interesting to investigate if attitude towards green behaviour can be affected by the use of priming.

2.1.2 Perceived behavioural control

The perceived behavioural control is added to the model to deal with situations where consumers may lack complete volitional control over their behaviour. Perceived behavioural control can be split into two elements: self-efficacy and controllability. Self-efficacy refers to the beliefs of individuals that they can perform a certain behaviour. Controllability does recognize that some things are out of our control (Daiton & Zelley, 2015). It was found that individuals are more likely to engage in pro-environmental behaviour if they believe that they have the ability to solve problems regarding the environment through their behaviour (Grob, 1995; Huebner & Lipsey, 1981). It was found that perceived behavioural control has a significant effect and a positive impact on green behaviour. (Ma, Littrell, & Niehm, 2012; Wang, Liu, & Qi, 2014) It can be said that there is some evidence that perceived behavioural control positively influences green behaviour, further research is warranted due to the limited research in the area (Joshi & Rahman, 2015).

To investigate the effect of perceived behavioural control on priming effects, it is included in this research as a moderator. Therefore, this hypothesis is introduced before the main hypothesises. The hypothesis of the moderating effect of perceived behavioural control is formulated as follow:

> *H4: Effects of priming on attitude, generativity, purchase intention and product choice with regarding green behaviour are stronger for people with positive perceived behavioural control towards green behaviour, compared to people with negative perceived behavioural control.*

2.1.3 Subjective norms

Subjective norm is defined by Ajzen (1991) as the perceived social pressure to perform or not to perform behaviour. It can also be described as an individual's perception, or an opinion about which important actions others believe the individual should do to perform or not to perform behaviour in a certain situation (Finlay, Trafimow, & Moroi, 1999). Social influence is defined by Goldsmith (2015) as "how one person or group affects other's opinions, attitudes, emotions or behaviours" (p. 3). The social influence is divided into descriptive social influence and injunctive social influence. Injunctive social influence reflects the perceptions of what significant actions others approve of or think one ought to do. The descriptive social influence is concerned with the pressure from one's social environment to perform a certain behaviour (White, 2009). It has been noted that subjective norms are important predictors for the behavioural intention and actual environmental behaviour. Environmental behaviour depends on the activation of moral norm rather than on the influence of the general environmental concern. People feel more responsible when they are aware of the negative consequences that come from nonparticipation (Herberlein & Black, 1976; Schwartz, 1968).

To investigate the effect of subjective norms on priming effects, it is included in this research as a moderator. Therefore, this hypothesis is introduced before the main hypothesises. The hypothesis of the moderating effect of subjective norms is formulated as follow:

> *H5: Effects of priming on attitude, generativity, purchase intention and product choice with regarding green behaviour are stronger for people with positive subjective norms towards green behaviour, compared to people with negative subjective norms.*

Explaining and understanding human behaviour regarding the climate is a complex task. This is due to difficulties in measuring factors that influence the climate and evaluate the relationships on the intention of people. Abrahamse et al. (2005) described that the energy consumption is an outcome of a complex relationship between external factors (E.g., economy, technology, demographics) and the individual's motivational factors (attitude, preference), opportunities and abilities. It can be concluded that the intention of people in their behaviour depends on different factors that are all influenced by moderators. Therefore, understanding human behaviour is useful to different factors and to indicate the influence of the moderators.

2.2 Generativity

Generativity is defined as the ability to transcend personal interests to provide care and concern for younger and older generations (Hutchison & Elizabeth, 2010). It has been investigated that consumers do not always base their buying decisions on their attitudes towards the environment, even though the attitudes that they have can have a strong influence on their purchases (Vlosky, Ozanne, & Fontenot, 1999). The attitude of an individual towards the future is important, as such, there is an obligation on the part of the current generation, to secure the world for future generations. It is essential to provide the next generation with a sustainable environment (Urien & Kilbourne, 2011). Thus, it is important for young people to be well informed and concerned with environmental mentalism and further issues regarding sustainability and the climate to provide care and concern for younger and future generations. (Furlow & Knott, 2009). Within this research, the impact of priming on generativity towards green behaviour will be studied.

2.3 Green behaviour

The emergence of the environmental problems such as global warming in the 90s moved the environmental issues from the fine prints into the spotlights and it enhanced the sensitivity of people for the environmental issues (Kalafatis, Pollard, East, & Tsogas, 1999). The consumers were faced with a new importance, the environmental responsibility gave birth to a pro-environmental behaviour which is also called green behaviour (Kollmuss & Agyeman, 2002). Green behaviour is a complex form of ethical decision-making behaviour that is considered as a type of socially responsible behaviour. A green consumer "takes into account the public consequences of his or her private consumption and attempts to use his or her purchasing power to bring about social change" (Moisander, 2007). A green product is defined as one which does satisfy consumers' needs without damaging the environment and contributing towards a more sustainable world (Shamdasani, Chon-Lin, & Richmond, 1993). In order to explain consumer green purchase behaviour, previous studies focused on describing the underlying attitudes, values and behavioural intentions towards environment friendly products (Davies, Foxall, & Pallister, 2002; Vermeir & Verbeke, 2006).

It was measured if consumers value a sustainable environment and if their purchase intentions are focussed on a sustainable environment. A study was created in the Netherlands to investigate the ecological purchase intentions in the Netherlands. A sample of 2668 respondents was utilized to determine if consumers care about a sustainable environment and if their purchase intentions are corresponding their beliefs. It was found that 87% of the respondents agree that a sustainable environment is important and that they belief that people should buy green products. It is interesting that only 42% of the respondents strives for eco-friendly consumption. It was also proven that a positive environmental attitude is an influential indicator for ecological purchase intentions. It is

therefore interesting to investigate if priming could positively influence the purchase intention regarding green behaviour.

Because of the awareness of the environmental issues, environmental marketing is becoming more and more important (Tiwari, Tripathi, Srivastava, & Yadav, 2011). The emergence of the green dimension came along with new business opportunities. Marketers and organizations had opportunities to develop pro-active environmental strategies and to develop green products. Effective marketing instruments and the influencing of the perception of consumers can help position these products and categories in the competitive area and gain a competitive edge by differentiating themselves from non-green but similar alternatives (Han, Hsu, & Sheu, 2010).

The business ethical decision-making is influenced by environmental factors that people are unaware of. These results were found by Tsalikis (2014), he presented a study to examine the effect of priming on the business ethical decision making. The experiment was conducted among American and Dominican respondents. The respondents received a consent form and one of the three versions of the questionnaire. The respondents were presented with a series of five words, and they had to make up a complete sentence using four of the five presented words. It was concluded that people who were primed with words such as rudeness perceived the scenarios as less unethical than people that were primed with words such as politeness. The results therefore indicated that business ethical decision making is influenced by environmental factors that people are not aware of.

A design method was created by She & MacDonald (2012) that uses priming to support designers to communicate sustainability via design at an early stage in the design process. The sustainability was communicated through product features that will be identified as sustainable by the customer. A controlled experiment was designed and conducted to test the effect of priming on ideation under three prime conditions. These conditions are a questionnaire prime, a collage prime and no prime. After interacting with prime, subjects did design new features for a target product. They then evaluated the features that they had generated for their ability to trigger thoughts of sustainability. The final stage was that the subject elaborated on their designs, counted the features they had generated and described their thinking process. The results showed that priming can be a promising indicator to increase designs for sustainability communication in ideation, beyond increasing the sheer number and novelty of features (She & MacDonald, 2012).

Another study that found priming effects was the study of Tate, Stewart & Daly (2014). They conducted a study where participants that were primed with an environmental goal selected a significantly greater proportion of loose products in a hypothetical choice task compared to the control group. Positivity was also increased towards loose products mediating the effect of goal priming on choice. It was also found that goal priming produced more environmentally friendly choices independently of environmental attitudes. (Tate, Stewart, & Daly, 2014). Welsh & Ordóñez (2014) investigated the effects of subconscious primes on ethical behaviour. Subconscious ethical and unethical priming was used to test the effects of subconscious processing on the ethical behaviour through an automatic process of schema activation and implicit association. It was concluded that subconscious ethical and unethical priming activated the moral standards and thus increased the ethical categorization and reduces the unethical behaviour. (Welsh & Ordóñez, 2014)

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2.4 Subliminal priming

Subliminal advertising became notorious in 1957 through the research of James Vicary. He claimed that the sales of popcorn and Coca Cola considerably increased after flashing the subliminal messages "Eat popcorn" and "Drink Coca Cola" to cinema visitors in a New Jersey Theater. The results of the study displayed an increase of 57.5% of the sales of popcorn and an increase of 18.1% with regard to the Coca Cola sale. Finally, the study was determined as fraudulent, Vicary admitted that it was a publicity hoax. The fabricated study of Vicary is one of the most well-known studies on the subject and it gained attention on the topic (Karremans, Stroebe, & Claus, 2006). The study of Vicary aroused interest among many researchers, this resulted in various studies to measure the effects of subliminal priming in many fields.

The study of Karremans, Stroebe & Claus (2006) concluded that exposing individuals subliminally to a brand name increases the probability that they will choose for a certain brand. A research was conducted by visually priming a brand name of a drink and to test whether the respondents were more prone to choose for the brand which was primed and whether people were affected by the moderator thirst. The results indicated that the subliminal primes positively influenced the choice of the participants for the primed brand, but this was only for participants who were thirsty. It also concluded that the prime is likely to affect a person's action if the prime is applicable to the motivations of the person. This replicates the effectiveness of the use of subliminal visual priming regarding the recognition effect. Subliminal exposure has been used to prime goals, directly or through goal related constructs. Studies also found that priming general goals could influence the behaviour and cognitive processing.

Albarracin et al. (2008) demonstrated that activating a general action or inaction goal influenced behavioural outcomes. It has been shown that subliminal presentation of positive and negative images can influence the impression of people on others (Krosnick, Betz, Jussim, & Lynn, 1992). Legal et al. (2019) studied whether priming the goal "to trust" could influence the way a persuasive message is processed and the influence on the judgment of the behavioural intentions. It was hypothesized that goal priming would lead to a better acceptance of the persuasive message. Ninety-three participants took part in the experiment where a persuasive message was used to promote the benefits of drinking tap water. Before the experiment, the participants had to fill in a questionnaire to assess their initial attitudes toward tap water. The subliminal priming occurred on a computer screen where they were asked to start a study on visual attention. The results indicated that participants that were subliminal primed with the goal of trusting did not only evaluated the message and the source more positively but also expressed more behavioural intentions in line with the message. As the mentioned studies indicate, there is an effect of subliminal priming on the behaviour of people.

A study of Strahan et al. (2002) researched the role that motivation can have in the relation of subliminal priming and persuasion. Participants took part in an experiment where they were asked to taste various products. Before the experiment people were not allowed to eat or drink for three hours. At first, participants had to eat a cookie. After they ate the cookie, they received water to "cleanse their palate" or they did not. At second, participants had to complete a computer task, during the task, there were primes with thirst related words or neutral words. They were exposed to 26 subliminal primes with a duration of 16ms. Thirdly, participants had to taste test two beverages. The results indicated that subliminal priming did not affect the amount that participants drank when they were

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saturated, but it affected the participants when they were thirsty. The participants that were thirsty drank more when they were primed with the words related to thirstiness.

Various studies indicate that the use of subliminal priming in gaming content does affect people. According to Lang (2000), media messages could be conceived as an ongoing steam of auditory and visual stimuli. For the media user to make sense of media messages there is a continuous process of coding, retrieval, and storage. Due to the fact that the capacity of the media user has a ceiling to run simultaneously, the human information processing system is equipped with mechanisms to select stimuli. The cognitive process that takes place when the visual is subliminally projected is a stage which is called subconscious processing. During this stage, high-level semantic and emotional processing has been observed. Semantic processing refers to the processing after we perceive a stimulus and encode its meaning. The semantic processing causes us to relate the stimuli we perceived to other stimuli with similar meanings. Emotional processing refers to the processing of the stimuli to influence empathic judgments and brain activations that are related to the stimuli (Treisman, 1964; Govier & Pitts, 1982; Potthoff, et al., 2013).

Different studies concluded that subliminal primes in videogames do influence the players. It is concluded that subliminal presentation of happy faces lead players to evaluate a computer game more positively than when they are subjected to angry faces, there were also primes of certain products like Dextrose pills. There were 64 participants who were exposed to playing a computer game. Before the experiments, the participants were asked to fill in a questionnaire about their actual state which measured the tiredness of participants. The participants played a strategic game in which they were exposed to twenty-eight questions. After finishing the game, the participants could choose two different products which were energy pills, of which one was Dextrose. These results did conclude that participants with a specific need or motivation did choose the subliminally presented motivation-related product more often. So, when a person was tired already, the prime was effective, when the person was not tired, the results were less effective (Bermeitinger, et al., 2009). Neuberg (1988) concluded that subliminal primes, in interaction with the subjects' behavioural predispositions towards competitiveness or cooperation in the game situation did had a significant influence on the competitiveness of the subject behaviour. When the competitive subjects were exposed to a competitive prime, they played more competitively than when they were exposed to neutral primes. A study was conducted where players were exposed during the game to subliminal messages, which were logos. After the game was finished, the recognition effect was studied, it was concluded that subliminal visual priming in videogames does influence the players with regard to the recognition effect. This study was conducted using a shooting game (Nuijten, de Regt, Calvi, & Peeters, 2013).

Subliminal priming remains a controversial subject due to the publicity hoax of Vicary. It is important to conduct an objective research to examine the influence of subliminal priming on the behaviour of people. The results could be valuable for market purposes. Subliminal priming could cause a form of persuasion, this can be explained by the Elaboration Likelihood Model (ELM). This model describes how the communication of primes can affect the attitude. The model is developed by Petty and Cacioppo (1986) and is based on two routes that are the central route and the peripheral route. The central route consists of a person's careful and thoughtful consideration of the true merits of the information that is presented. The peripheral route occurs as a result of some simple clue in the persuasion context that induced change without necessitating scrutiny of the true merits of the

information that is presented (Petty & Cacioppo, 1986). Priming persuades through peripheral processing.

It is important to investigate if subliminal priming in this research have affect the dependent variables. Because of the recent studies, it is expected that the use of subliminal priming positively influences attitudes, generativity, purchase intention and product choice regarding green behaviour. Therefore, the following hypothesis was formulated:

H1: Subliminal textual priming related to green behaviour positively influences attitudes(H1a), generativity (H1b), purchase intention (H1c) and product choice (H1d) with regard to green behaviour, as opposed to when these primes are absent.

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2.5 Supraliminal priming

There are multiple degrees to what extent an individual could be aware of the stimuli priming. Priming is generally delivered using a supraliminal stimulus presented before the desired behaviour. Supraliminal priming is used to influence behaviour of people unconsciously, it is shown that supraliminal primes have a stronger and longer-lived effect on behaviour compared to subliminal priming (Francken, de Lange, & van Gaal, 2011). Supraliminal primes are able to occupy a larger set of the brain sections than subliminal primes, this is also due to the duration of the prime (Kouider, Dehaene, Jobert, & Le Bihan, 2007). Individuals that are exposed to supraliminal primes are consciously aware of the stimulus but not aware of the intention of the prime (Bargh & Chartrand, 2000). Previous research concluded that when the individual becomes aware of the intent of the stimulus, it could still influence their behaviour (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001).

A supraliminal priming technique that is frequently used is the "Scrambled Sentence Test" which was first used by Costing (1969) as a clinical projective test but was adapted by Srull and Wyer (1979) in their trait construct priming research. Participants were told that the task was designed to measure their language ability and they were instructed to make coherent grammatical sentences out of each string of words. In the process they were exposed to words that are related to the concept the experimenter wishes to prime. The priming stimuli are generally selected using a thesaurus for close synonyms of the to-be-primed constructs. Pre-testing could also be used to supplement the set of synonyms in the case when more or varied priming stimuli are needed. The pre-test will be fulfilled by separate groups to rate the degree in which a potential prime is related to the target concept. It is wise to use many words that are synonyms because repetition of the words may give participants a clue of the purpose of the experiment. A funnelled debriefing could be used to ensure the awareness checks of the supraliminal tasks. The study concluded that using supraliminal textual priming positively influenced the participants with their language ability.

It is found that the activation from a conscious, intentional processing of the primes is stronger than the subconscious activation. Positive supraliminal priming is a promising technique to enhance the job-related performance of elderly employees (Kirchner, Völker, & Bock, 2015). In this research twenty healthy older employees of a wholesale market were participating. The participants were randomly assigned to two groups, a positive group, and a negative group. The testing took place at the workplace of the participants. First the participants were exposed to twenty sets of five words that were printed on paper cards. The cards were presented sequentially, and participants were asked to form meaningful sentences with four words from each card. For the positive group, each card included one word that reflects a positive stereotype regarding old ages. The positive group was 38% faster than the neutral group. It was concluded that positive priming could help the employees to achieve better work efficiency and therefore a better job satisfaction (Kirchner, Völker, & Bock, 2015). This research shows that the use of textual supraliminal priming positively influences the employees.

Mandel and Johnson (2002) demonstrated how visual primes influence product choice. This study consisted of different groups that went shopping for hypothetical products in an identical online shopping environment, except for the background pictures and colours of the web page. With the experimental task of purchasing a sofa, it was noticed that using a blue background with fluffy clouds increases the importance of comfort information in searching information and the likelihood that a more comfortable sofa is selected. A green background with pennies increases the importance of price information (Mandel & Johnson, 2002).

It is important to investigate if supraliminal priming in this research have affect the dependent variables. Because of the recent studies, it is expected that the use of supraliminal priming positively influences attitudes, generativity, purchase intention and product choice regarding green behaviour. Therefore, the following hypothesis was formulated:

> *H.2. Supraliminal textual priming related to green behaviour positively influences attitudes(H2a), generativity (H2b), purchase intention (H2c) and product choice (H2d) with regard to green behaviour, as opposed to when these primes are absent.*

2.6 Priming

In different studies (Bargh, Chaiken, Govender, & Pratto 1992; Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Hermans, De Houwer, & Eelen, 1994), it was demonstrated that there were significant priming effects when using prime-target pairs for which the affective relation was manipulated. In the affective prime studies, the positive or negative primes are presented for 200 milliseconds, they are followed by a positive or negative target stimulus after an interstimulus interval of 100 milliseconds, resulting in a stimulus onset asynchrony of 300 milliseconds (Hermans, De Houwer, & Eelen, 2001).

The ground-breaking priming study for social psychology came when, Higgins, Rholes and Jones (1977) demonstrated that personality trait concepts could be primed by recent use. The study consisted of the same studies paradigm as Segal Had with his colleagues. Higgins et al. (1977) used certain personality traits as part of a memory experiment. After the memory experiment the participants read about a target person with the name of Donald who behaved dubiously related to primed traits such as conducting this by himself, for example, studying by himself. Participants were exposed to different words and people who were exposed to words as independent and adventurous were more positive impressions of Donald than participants who were exposed to words such as aloof and reckless. It is important to investigate the effect of priming on people to chart the way people can be influenced using primes.

Subliminal visual priming does rely on visual stimulation without the use of other stimulus types. A type of visual priming is masked priming and results in only 14% of objects that are named. Masked refers to the symbols that are displayed before or after the prime. It has been shown that visual priming does last longer than semantic priming with regard to the influence on the subject and is resilient against stimuli intervening the priming and the intended target word. During the research of Elgendi et al. (2018) there were flashed masked pictures. The results indicated that 13.5% of the participants

were able to name them. The pictures were shown again 15 seconds later without an indication of possible repetitions, this increased the naming accuracy to 34.5%. They concluded that there was a significant effect of the subliminal prime on the naming accuracy.

As mentioned in the introduction there was an effect of subliminal textual priming on politics. The usage of the word RATS influenced the ratings of politicians, and it was concluded by Weinberger & Westen (2008) that the word RATS had a negative impact on the evaluation of politicians. It was studied by Kobilsek (2012) what the effect of visually primed words on a desktop was on the effect of the people's choice of words in real life situations. 108 respondents participated in the study and were exposed to a series of four words, in which they had to choose one word. Before the series began, a countdown was exposed in which a word was subliminally primed in the fifth series. It was concluded that subliminal messages cannot be used to change the choice of words of people in real life.

Recent studies suggest that in absence of supraliminal information, the subliminal information will not have enough power to induce the long-term priming effects. There is sufficient evidence that the subliminal information can have short-term priming effects (Kiefer & Martens, 2010). It is an explanation for the lack of long-term priming effects in the absence of supraliminal information. It is expected that without the presence of supraliminal items, there are not enough matching features for priming to occur. De Winter (2015) investigated the interaction effect between subliminal priming and supraliminal priming on long-term repetition priming. He constructed a research where people will be exposed to subliminal and supraliminal primes. It was investigated whether the order in which the primes were shown had an effect. It was concluded that subliminal primes that are shown after supraliminal targets are identified more frequently than the novel items and when the subliminal primes are presented before the supraliminal targets.

The Dutch government state that "directing behaviour through automatic and unconscious thought processes is only permissible if it reinforces the ability of citizens to resist temptations that do not correspond to their own values and goals" (Raad voor Volksgezondheid en Samenleving, 2014). It is expected that there is full transparency about the instruments which are being used. In this context, priming would be allowed when the primes are used to make choices that correspond with the own goals and values of people. The purpose of this study is to support people in making choices that improve green behaviour and is not misleading people into performing a behaviour with negative consequences.

It is important to investigate if the subliminal- and supraliminal primes in this research have an interaction effect. Because of the recent studies, it is expected that the different types of priming potentially strengthen each other. Therefore, the following hypothesis was formulated:

H3. Presence of both supraliminal- and subliminal priming causes an interaction effect which positively influences attitudes(H3a), generativity (H3b), purchase intention (H3c) and product choice (H3d) with regard to green behaviour, as opposed to when these primes are absent.

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2.7 Priming in video content

Priming can be defined as an incidental activation of the knowledge structure of a person that can lead the person to perform specific behaviour and attitudes (Bargh, Chen, & Burrows, 1996). A study was conducted where measures were taken to investigate whether people can be guided to mention specific keywords with video and/or picture priming. It was shown that the participants tended to mention more keywords with priming videos and pictures. The same results were found by the use of virtual reality in the experimental setting (Brinkman, Wiggers, & Heynderickx, 2013). The study confirmed that priming videos and priming pictures increase the change that people use specific words in their answers in a real-life conversation. Priming with videos and pictures seems to be as effective as priming in the real world (Brinkman, Wiggers, & Heynderickx, 2013).

Elgendi et al. (2018) concluded that subliminal priming is a growing area of studies that requires systematic and collaborative efforts to maximize its potential and the impact. There have been conducted different studies towards subliminal priming and in videogames, but never a study was conducted towards the effect of subliminal priming in videos on the product choice. Based on the mentioned studies it was concluded that subliminal priming in video content does influence people. It was found that the subliminal primes do affect the behaviour of the participants and the recognition effect. The results of Bermeitinger et al. could be questioned because people were influenced by the extern factor tiredness when conducting the research.

Priming can be defined as an incidental activation of the knowledge structure of a person that can lead the person to perform specific behaviour and attitudes (Bargh, Chen, & Burrows, 1996). A study was conducted where measures were taken to investigate whether people can be guided to mention specific keywords with video and/or picture priming. It was shown that the participants tended to mention more keywords with priming videos and pictures. The same results were found by the use of virtual reality in the experimental setting (Brinkman, Wiggers, & Heynderickx, 2013). The study confirmed that priming videos and priming pictures increase the change that people use specific words in their answers in a real-life conversation. Priming with videos and pictures seems to be as effective as priming in the real world (Brinkman, Wiggers, & Heynderickx, 2013).

2.8 Research model

The purpose of this study is to measure the effects of subliminal- and supraliminal priming on attitude, generativity, purchase intention and product choice with regard to green behaviour. The possible interaction effect between the two types of priming will be measured. Furthermore, it will be studied whether subjective norms and perceived behavioural control regarding green behaviour will have a moderating effect on the priming effects. The following research model will be central to this study.
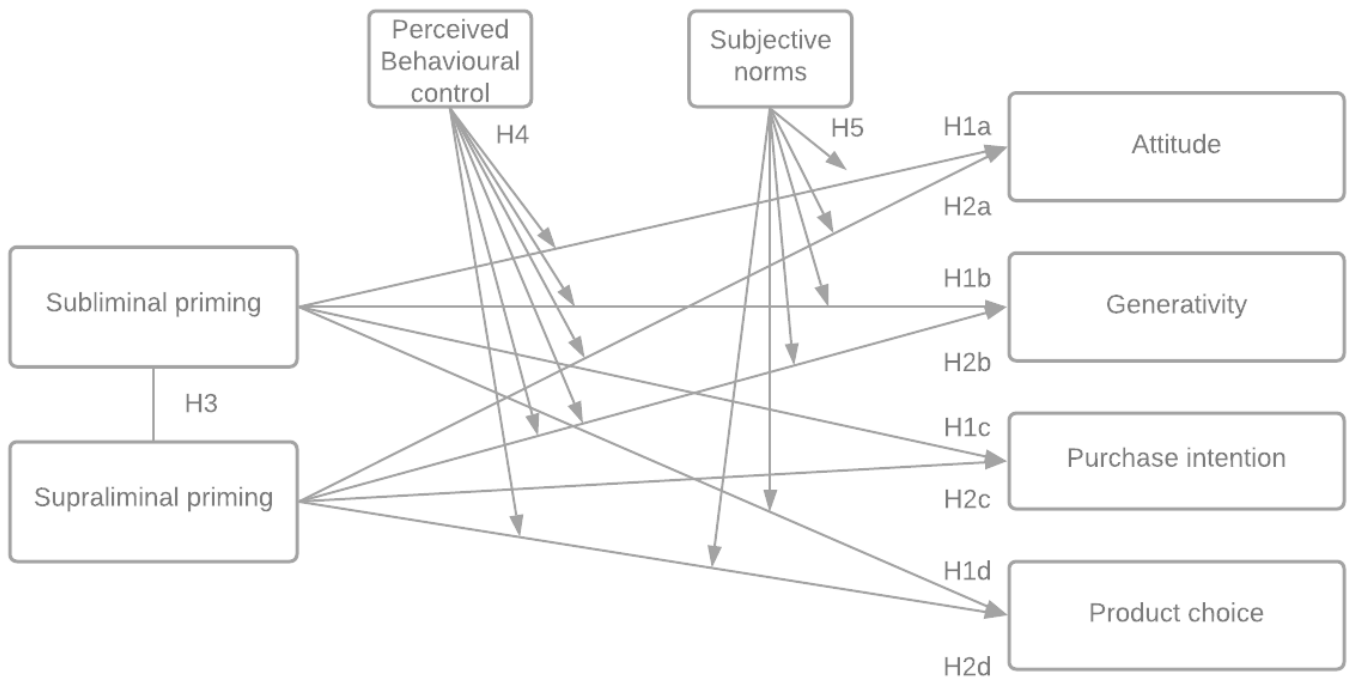

Figure 1 Research model

An experimental study on the impact of subliminal- and supraliminal priming on attitude, generativity, purchase intention and product choice with regard to green behaviour.

3. Research design and methodology

In this chapter, the methodology of the current study will be explained. The research design and procedure will be elaborated upon. Furthermore, priming stimuli, measures and participants of this research will be described. Finally, analyses measuring reliability, validity and results of the study are explained.

3.1 Research design

The research model was tested by conducting a 2 (subliminal priming: present vs absent) x 2 (supraliminal priming: present vs. absent) between-subject research design, with perceived behavioural control and subjective norm towards green behaviour as moderating variables. The independent variables were manipulated to test the effects of priming on generativity, attitude, purchase intention and product choice.

Respondents were randomly assigned to one of four conditions. The respondents were exposed to a video containing one of two types of priming, both types of priming or no primes. There has been conducted a 2 x 2 between-subjects design that consists of the following four conditions. Quantitative data were gathered through a questionnaire, which was used to measure effects on the dependent variables. The questionnaire was also used to measure if subjective norms and perceived behavioural control regarding green behaviour had a moderating influence on priming effects.

Table 1 Research design

Condition	Manipulation	Number of participants
Condition 1	Subliminal- and supraliminal priming	58
Condition 2	Subliminal priming	63
Condition 3	Supraliminal priming	59
Condition 4	No priming	59
	Total numbers of participants	239

3.1.1 Independent variables
This research studied the potential effects of both subliminal and supraliminal priming. To measure if there was an interaction effect between the two types of priming, they were combined in one of the manipulations.

3.1.2 Dependent variables
The main aim of the study was to examine whether attitudes, generativity, purchase intention and product choice regarding green behaviour could be affected by the use of primes. Prior research indicated that purchase intention, attitude and generativity are sub elements of green behaviour (Joshi & Rahman, 2015; Paco, Alves, & Shiel, 2013). Therefore, it seemed interesting to study the effects of priming on these elements. Therefore, these subjects were used as dependent variables.

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3.1.3 Moderating variables

Based on prior research, a positive relationship between perceived behavioural control and subjective norms towards green behaviour and priming was expected (Gollwitzer, Sheeran, Trötschel, & Webb, 2011; Weingarten, et al., 2016; Pligt & Vliek, 2016). Therefore, it was tested if perceived behavioural control and subjective norms moderated the strength of the priming effects. For both moderators a new variable was created. These variables are SNsplit (subjective norms split) and PBCsplit (perceived behavioural control split). These variables have been split by measuring the median of the variables. By splitting these variables by the use of the median, the variables could be split both in a positive and a negative group.

3.2 Stimuli

In order to examine the 2 x 2 research design, four different videos were developed, for the video content a video related to gaming was chosen. All videos were displaying the development of a city. The videos were edited with the software of Sony Vegas Pro. The participants were randomly assigned to one of the four conditions. The viewers were guided step-by-step on how the city was developed. The explanation of every development was on the right top corner. Primes were added throughout the video to examine whether these primes had an effect on the respondents.

3.2.1 Pre-study

In order to examine the extent to which respondents positively associate words with green behaviour, a pre-test was conducted. A measurement was created by using Qualtrics and was distributed through social media. Thirty participants between the age of 16 and 34 entered the measurement, of which 19 respondents (mean age 23.1) successfully finished. Firstly, participants were asked to fill in five words that they positively associate with green behaviour. An overview of the words given by the participants can be found in Appendix B. Words which are believed to be unrelated to this study were left out.

Secondly, respondents were asked to rank 17 words from the most to the least positively related to green behaviour. The list was created with the use of organisations such as WWF and WNF. Based on the outcome of the pre-test, four words were selected for priming manipulations. This was done by combining the amount of times a word was filled in during the first task and the ranking position of words that were collected during the second task. The following words were used for the priming manipulations: 'groen' (green), 'duurzaam' (sustainable), 'milieubewust' (environmentally conscious), 'elektrisch' (electric). The results of the pre-test can be found in Appendix B.

3.2.2 Subliminal priming

Respondents in the conditions with subliminal priming were exposed to words that are related to green behaviour such as "duurzaam". The duration of the primes was 33 milliseconds per word (Cooper & Cooper, 2002; Kam, 2007; Sato, Kochiyama, Minemoto, Sawada, & Fushiki, 2019; Strahan, Spencer, & Zanna, 2002). Four words were used which are related to green behaviour. These words would be repeated because it was concluded by van den Bussche et al. (2009) that priming effect occurs more often with repeated primes than novelty primes. Visual priming with images was also considered for this study but it was not technically feasible to implement these primes.

3.2.3 Supraliminal priming

To ensure that there was no difference between the primes, the supraliminal primes consist of the same words that were used for the subliminal primes. Based on prior research, the duration of the

supraliminal primes was 1500ms each (Sato, Kochiyama, Minemoto, Sawada, & Fushiki, 2019). Four supraliminal priming words were used and these words were repeated. It was concluded by van den Bussche et al. (2009) that priming effect occurs more often with repeated primes than novelty primes.

3.3 Procedure

Respondents were asked to take part in an experiment by the use of online sources. Respondents were told that they needed to remember how the city was developed. Questions were asked regarding the memorization of the video after the questions regarding the experiment were shown. Respondents entered the experiment through Qualtrics.

The study was focused on people from The Netherlands in the age group 16-34. Therefore, the experiment was created in Dutch. People were asked to take part in an experiment. First, an introduction was given that explained the aim of the study. Participants were told that the aim of the research is to measure to what extent people memorize developments in gaming videos. First, measurements took place regarding demographic questions about their age, gender and highest level of education. Then, the participants were exposed to a video which they needed to watch on full screen. There were four videos to which the participants were randomly selected to one video. After watching the video, the participants completed a memorization task and answered questions regarding their product preference. The participants had to make a choice about the development of the city shown in the video. The moderating variables were measured by the use of scales. For every condition it was determined whether there was a positive or negative effect of the moderator and how this affected the choice that was being made.

After watching the video, people were asked to make a choice between two options, these were options that they can choose for future developments in the city. When the respondent finished the choice for their development of the city, the participants were asked to fill in a questionnaire to measure the dependent measures. Example items for each measure are given in the following table. All the items that were used to measure the dependent variables can be found in Appendix A.

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Table 2 Overview of dependent measures

Dependent measures	N	Example Item(s)	References
Attitude towards green products	7	"I think it is important to use green products"	(Leiserowitz, Maibach, & Roser-Renouf, 2010; Witmarsh, 2009; Leviston, 2013)
Generativity	6	"I believe buying green products improves the world for future generations"	(Davide & Passini, 2015)
Purchase intention	6	"I intend to buy green products"	Leiserowitz, Maibach, & Roser-Renouf, 2010; Azjen, 1991; Leviston, 2013)
Perceived behavioural control	7	"I can afford to pay more for green products if I want to"	(Yoon, Kyle, van Riper & Suton, 2010; Azjen, 1991)
Subjective norms	6	"People who are important to me think I should use green products"	(Yoon, Kyle, van Riper & Suton, 2010; Azjen, 1991)

3.4 Measures

The data was collected using Qualtrics. The product choice of participants was indicated. After the experiment was completed, there was an overview on the statistics of the experiment available via Qualtrics.

3.4.1 Product choice

To measure product choice of the participants a questionnaire was developed by the use of Qualtrics. Participants were exposed to the video, they completed the memorization task and afterwards they selected an option which they would use for further development of the city. There was a selection for the options. It was studied whether the options were similar, also the options were not visible in the videos used in this study. This would not influence the decision of the participants. For example, two types of car factories were shown. One of the options would be a petrol driven car factory and the other option would be the electric car factory. To avoid biased results, the participants had to choose between similar products. The participants had to make 10 different choices. In the following table all options are given.

Table 3 Example option product choice

Green	Non-Green

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Central Park

Theme Park

Recycling plant

Waste processing complex

Bio fuel Bus depot

Petrol bus station

Bycicle lane

Road

Eco water outlet

Water drain pipe

Yoga garden

Skatepark

Bid and bee haven

Traffic park

Electric car factory

Petrol car factory

School of environmental studies

School of engineering

Organic specialized commercial zone

Leisure specialized commercial zone

An experimental study on the impact of subliminal- and supraliminal priming on attitude, generativity, purchase intention and product choice with regard to green behaviour.

3.4.2 Purchase intention

To investigate whether purchase intention would be affected by priming a questionnaire was developed. A five-point Likert scale was used to measure the responses. The scales were derived from Leiserowitz, Maibach, & Roser-Renouf (2010), Azjen (1991) and Leviston (2013). The construct is aimed at measuring the purchase intention of green products (e.g. "I intend to buy green products")

3.4.3 Generativity

To measure whether generativity with regard to green products could be affected by priming, the scale of Davide & Passini (2015) was used. A total of 6 items were selected (e.g., "I believe buying green products improves the world for future generations"). A five-point Likert scale was used to measure the response.

3.4.4 Attitude

To measure whether attitudes with regard to green behaviour could be affected by priming, three scales from Leiserowitz, Maibach, & Roser-Renouf (2010) and Witmarsh (2009) and Leviston (2013) were derived. Seven items (e.g. "I think it is important to use green products") were selected to measure its effect. A five-point Likert scale was used to measure the responses.

3.4.5 Moderators

Subjective norms and perceived behavioural control towards green products were measured to investigate whether they moderate priming effects. To measure the moderating effect of subjective norms, two scales from Yoon, Kyle, van Riper & Suton (2010) and Azjen (1991) were used. Seven items measuring subjective norms towards green products were selected (e.g., "People who are important to me think I should use green products"). The five-point Likert scale was used to measure the responses.

To measure the moderating effect of perceived behavioural control, two scales from Yoon, Kyle, van Riper & Suton (2010) and Azjen (1991) were used. Six items measuring subjective norms towards green products were selected (e.g., "I can afford to pay more for green products if I want to"). The five-point Likert scale was used to measure the responses.

3.5 Participants

The study was focused on people in the age category of 16- and 34 years old who live in The Netherlands. The study was focused on this age group because this group contains the most consumers of online video content. Because the experiment took place in the Netherlands, the language used in the experiment was Dutch. Respondents were asked to take part in the experiment. A total of (N=239) participants were recruited as they voluntary agreed to participate in the experiment.

Table 4 Statistics participants

Condition	Manipulation	N=	Age	Gender	Level of education
1	Subliminal- and supraliminal priming	58	M= 23,69 SD = 3,45	Male = 44,8% Female = 53,4% Rather not answer = 1,7%	Wo (37,9%), hbo (27,6%), havo/vwo (24,1%), mbo (6,9%), vmbo/mavo (1,7%), other (1,7%)
2	Subliminal priming	63	M = 23,70 SD = 3,65	Male = 57,1% Female = 42,9%	Hbo (34,9%), havo/vwo (30,2%), wo (23,8%), mbo (9,5%), vmbo/mavo (1,6%)
3	Supraliminal priming	59	M = 23,88 SD = 3,30	Male = 39,0% Female = 61,0%	Hbo (45,8%), wo (25,4%), havo/vwo (15,3%), mbo (11,9%), other (1,7%)
4	No priming	59	M = 24,46 SD = 4,15	Male = 54,2% Female = 45,8%	Hbo (28,8%), havo/vwo (28,8%), wo (25,4%), mbo (15,3%), other (1,7%)
Total		239	M = 23,90 SD = 3,64	Male (49,0%) Female (50,6%) Rather not answer (0,4%)	Hbo (34,3%), wo (28%), havo/vwo (24,7%), mbo (10,9%), other (1,3%) vmbo/mavo (0,8%)

In order to ensure that the groups did not significantly differ between age, gender and level of education, various analyses were performed. At first, an ANOVA was conducted which showed that there was no significant difference between the age groups ($F(7,765) = 0.538$, $p = .627$). Secondly, chi-square tests were conducted which show no significant variation between groups in the distribution of gender $\chi^2(6, N = 239) = 8,096$, $p = .231$ and level of education $\chi^2(15, N = 239) = 14.639$, $p = .478$.

To determine whether the measurements of the moderators measured what it supposed to measure, the validity of different constructs was tested. A factor analysis was conducted. The validity of initial items was measured using the principal component analysis. The factor loading had to be equal or had to exceed .70 to be considered significant. To increase the construct validity, items with a low loading were eliminated. The initial eigen values from the factor loadings were above 1. The total explained factor for all factors was 77%. All factors have a high Cronbach's Alpha value ($\alpha > .70$).

3.7 Analyses

To analyse the results, the multivariate analysis of variance (MANOVA) was conducted. The main effects of subliminal- and supraliminal priming, the interaction effect and the moderating effect of subjective norms and perceived behavioural control towards green behaviour were analysed. A threshold value significance alpha of .05 was needed to determine whether the dependent variables were significantly affected by the primes. Descriptive analysis was conducted to analyse the means of dependent variables to study patterns of the priming effects.

To analyse priming effects for all dependent variables, the univariate analyses of variance (ANOVA) was used. By using the ANOVA, it could be determined to which extent the dependent variable was affected by supraliminal and or subliminal priming. Profile plots were used to gain insight into priming effects. An overview of descriptive statistics of the priming effects were visualized which provided valuable insight into the results.

4. Results

In order to analyse the main effects of priming, the multivariate analysis of variance (MANOVA) was used. The MANOVA was used to measure effects of the independent variables subliminal- and supraliminal priming on the dependent variables attitude, generativity, purchase intention and product choice. It also measured whether subjective norms and perceived behavioural control moderated the priming effects. The results are shown in the table. The results concluded that there are no significant main effects of subliminal priming (F (4,224) = 0.148, p = .964, λ = .997) but a significant effect of supraliminal priming (F(4,224) =3,086, p = .017, λ =.948) on the dependent variables. There was a marginal interaction effect between subliminal- and supraliminal priming (F (4,224) = 2,142, p = .076, λ = .963.

When analysing the moderating effect of subjective norms and perceived behavioural control towards green behaviour on the strength of priming effects, no moderating effect was found by the moderators on the priming effects.

Table 5 MANOVA results on dependent variables (attitude, generativity, purchase intention and product choice)

Condition	λ	F-value	df	p
Subliminal priming	.997	.148	4	.964
Supraliminal priming	.948	3.086	4	.017*
Subliminal priming* supraliminal priming	.963	2.142	4	.076
Subliminal priming* subjective norms	.986	.820	4	.513
Supraliminal priming * subjective norms	.991	.507	4	.730
Subliminal priming* supraliminal priming * subjective norms	.997	.178	4	.949
Subliminal priming* perceived behavioural control	.986	.819	4	.514
Supraliminal priming * perceived behavioural control	.988	.674	4	.611
Subliminal priming* supraliminal priming * perceived behavioural control	.994	.353	4	.842

Note. significant effects are highlighted by the use of an asterisk (*). Marginal effects are highlighted by the use of two asterisks (**)

The table underneath shows the means of all different conditions. Here it can be seen that the mean score of supraliminal priming is the highest compared to the other conditions. Supraliminal priming is in this research the only condition with a significant effect on the dependent variables.

Table 6 descriptive statistics on dependent measures

	Mean	Std. Deviation	N
No priming	3.66	1.10	59
Subliminal priming	3.80	0.96	63
Supraliminal priming	4.20	0.88	59
Interaction	3.89	1.09	58

As the table underneath shows, the mean scores of dependent variables are mostly higher in the supraliminal priming conditions compared to other conditions. This indicates that supraliminal priming positively affected the dependent variables. There is a marginal significance on the interaction effect. The interaction effects has overall the second highest mean value.

Table 7 Conditions and scores of dependent variables

Condition	Dependent variable			
	Product choice	Purchase intention	Attitude	Generativity
No priming	M = 4.34, SD = 1.89	M = 3.36, SD = 0.79	M = 3.59, SD = 0.82	M = 3.36, SD = 0.88
Subliminal priming	M = 4.84, SD = 1.62	M = 3.41, SD = 0.69	M = 3.60, SD = 0.75	M = 3.34, SD = 0.77
Supraliminal priming	M = 5.75, SD = 1.58	M = 3.60, SD = 0.69	M = 3.85, SD = 0.58	M = 3.58, SD = 0.68
Interaction	M = 5.29, SD = 2.11	M = 3.40, SD = 0.66	M = 3.44, SD = 0.79	M = 3.44, SD = 0.79

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4.1 Attitude

In order to analyse the effects of priming on the specific dependent variables, the univariate analysis of variance (ANOVA) was used. The ANOVA was used to measure effects of the independent variables subliminal- and supraliminal priming on the dependent variable attitude. It was also measuring whether subjective norms and perceived behavioural control moderated the priming effects. The results are shown in the table. The results concluded that there are no significant main effects of subliminal priming $F = .006$, $p = .941$, but a significant effect of supraliminal priming $F = 3,940$, $p = .048$, on the dependent variable attitude was found, thus H2a was accepted. No interaction effect was found between subliminal- and supraliminal priming $F = 0.831$, $p = .116$ on attitude.

Table 8 Priming effects on attitude

Condition	*F*-value	*p*
Subliminal priming	.006	.941
Supraliminal priming	3.940	.048*
Subliminal priming* supraliminal priming	1.928	.166

Note. significant effects are highlighted by the use of an asterisk (*)

Analysing the profile plots, it shows that the mean score of attitudes towards green behaviour is higher when supraliminal primes are present. This is showed in the profile plot underneath.

Effects of supraliminal priming on attitude

	Supraliminal priming absent	Supraliminal priming present
Subliminal priming absent	3,54	3,84
Subliminal priming present	3,66	3,71
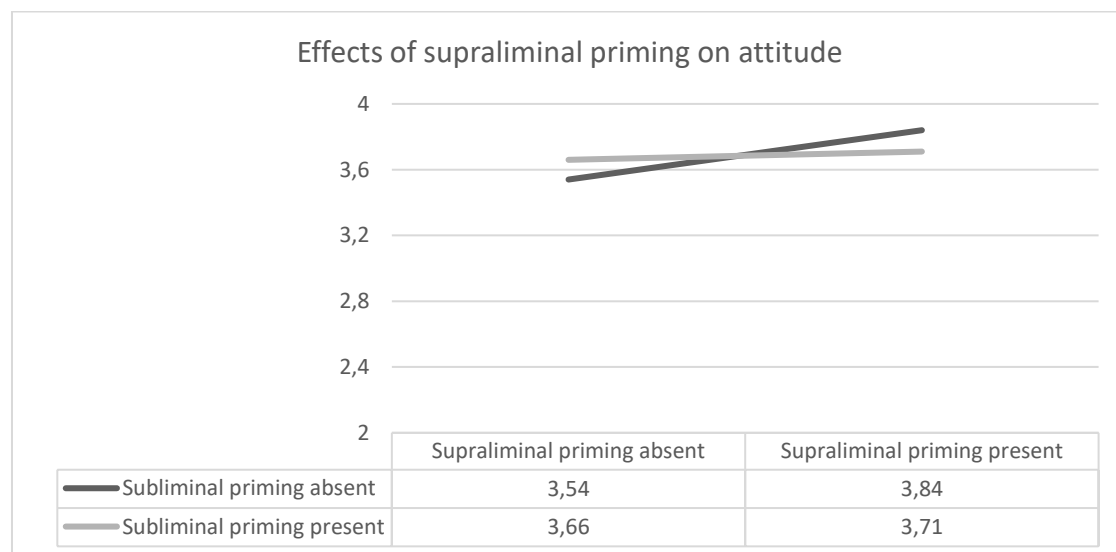
Figure 1 Effects of supraliminal priming on attitude

An experimental study on the impact of subliminal- and supraliminal priming on attitude, generativity, purchase intention and product choice with regard to green behaviour.

4.2 Generativity

In order to analyse the effects of priming on the specific dependent variables, the univariate analysis of variance (ANOVA) was used. The ANOVA was used to measure effects of the independent variables subliminal- and supraliminal priming on the dependent variable generativity. It was also measuring whether subjective norms and perceived behavioural control moderated the priming effects. The results are shown in the table. The results concluded that there were no significant main effects of subliminal priming $F = .129$, $p = .720$, also no significant effect of supraliminal priming $F = 1,596$ $p = .396$, on the dependent variable generativity was found. No significant interaction effect was found effect between subliminal- and supraliminal priming $F = 1.888$, $p = .171$ on generativity.

Table 9 Priming effects on generativity

Condition	*F*-value	*p*
Subliminal priming	.129	.720
Supraliminal priming	1.60	.208
Subliminal priming* supraliminal priming	1.89	.171

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4.3 Purchase intention

In order to analyse the effects of priming on the specific dependent variables, the univariate analysis of variance (ANOVA) was used. The ANOVA was used to measure effects of the independent variables subliminal- and supraliminal priming on the dependent variable purchase intention. It was also measuring whether subjective norms and perceived behavioural control moderated the priming effects. The results are shown in the table. The results concluded that there were no significant main effects of subliminal priming $F = .312$, $p = .577$ and there were also no significant effects of supraliminal priming $F = .723$, $p = .396$, on the dependent variable product choice. A significant interaction effect was found between subliminal- and supraliminal priming $F = 3.912$ $p = .049$ on purchase intention, thus H3d was accepted.

Table 10 Priming effects on purchase intention

Condition	F-value	p
Subliminal priming	.312	.577
Supraliminal priming	.723	.396
Subliminal priming* supraliminal priming	3.912	.049*

Note. significant effects are highlighted by the use of an asterisk (*)

An experimental study on the impact of subliminal- and supraliminal priming on attitude, generativity, purchase intention and product choice with regard to green behaviour.

4.4 Product choice

In order to analyse the effects of priming on the specific dependent variables, the univariate analysis of variance (ANOVA) was used. The ANOVA was used to measure effects of the independent variables subliminal- and supraliminal priming on the dependent dichotomous variable product choice. Respondents had to choose between two different choices. It was also measuring whether subjective norms and perceived behavioural control moderated the priming effects. The results are shown in the table. The results concluded that there are no significant main effects of subliminal priming $F = .022$, $p = .883$, but a significant effect of supraliminal priming $F = 11,244$, $p = .001$, on the dependent variable product choice was found, thus H2c was accepted. A significant interaction effect was found between subliminal- and supraliminal priming $F = 6.876$, $p = .009$ on the product choice, thus H3c was accepted.

Table 11 Priming effects on product choice

Condition	*F*-value	*p*
Subliminal priming	.022	.883
Supraliminal priming	11.24	.001*
Subliminal priming* supraliminal priming	6.88	.009*

Note. significant effects are highlighted by the use of an asterisk (*)

Analysing the profile plots as seen in figure 5, it shows that the mean score of a product choice of green products have a higher mean score when supraliminal primes are present. This can be seen in the profile plot underneath. It also indicates that when supraliminal priming is present, the effect of subliminal priming is higher. The supraliminal priming ($p = .001$) and interaction priming ($p = .009$) effects were strong enough to be reputably significant.

Effects of supraliminal- and subliminal priming on product choice

	Supraliminal priming absent	Supraliminal priming present
Subliminal priming absent	4,27	5,7
Subliminal priming present	4,94	5,11
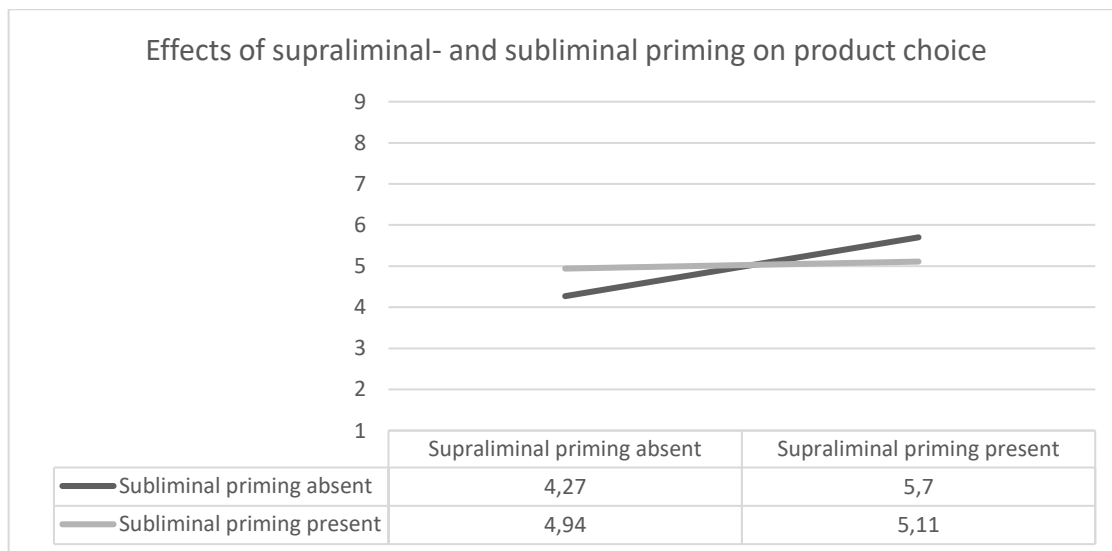
Figure 4 Effects of supraliminal- and subliminal priming on product choice

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4.5 Summarized overview

Concluded, main effects were found of supraliminal priming on product choice (p = .001). A main effect of supraliminal on attitude (p = .017) was also found. No main effects of subliminal priming were found on the dependent variables. An interaction effect of subliminal priming and supraliminal priming on product choice (p = .009) and purchase intention (p = .049) was found. A marginal interaction effect of subliminal priming and subliminal priming on attitude (p = .076) was found too. No moderating effects of subjective norms and perceived behavioural control on the priming process was found. As seen in the figures below, the mean scores of dependent variables were higher in priming conditions, where
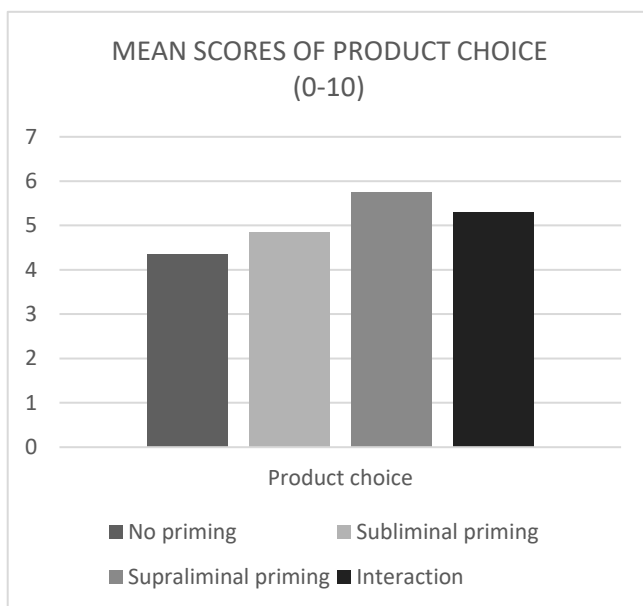
supraliminal priming was the only consistent effect.

Figure 5 Mean scores of product choice
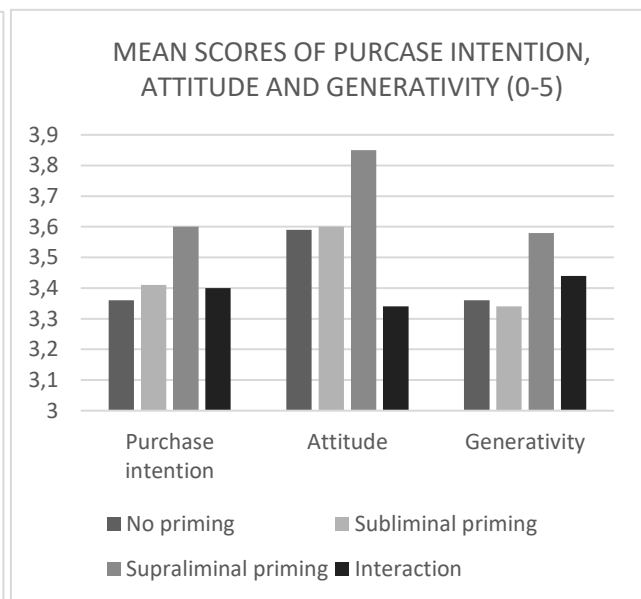
Figure 6 Mean score of purchase intention, attitude and generativity

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5. Discussion

This research investigated the extent to which supraliminal priming and subliminal priming can positively affect attitude, generativity, purchase intention and product choice regarding green behaviour. Based on prior studies, it was expected that subliminal- and supraliminal priming would positively affect the dependent variables. It was also expected that combining both types of priming would lead to an interaction effect and that perceived behavioural control and subjective norms towards green behaviour would moderate priming effects. The findings of this research will be discussed in the following section in order to identify potential implications, limitations and recommendations for future research.

5.1 Discussion of results

The outcome of this research showed that a significant effect of supraliminal priming the dependent variables was found. These outcomes were consistent with expectations based on prior research, this showed that product choice can be affected by supraliminal priming. The findings show evidence of subliminal priming affecting the dependent variables within the interaction effect. Prior research (Karremans, Stroebe, & Claus, 2006) showed that subliminal priming can affect the product choice, purchase intention and attitude.

Some outcomes of the main effects were consistent with expectations based on prior research and some outcomes were not consistent with expectations based on prior research. The research resulted in a significant effect of supraliminal priming on product choice. This positive effect is in line with the literature (Kirchner, Völker & Block, 2015; Mandel & Johnson, 2002). Mandel and Johnson (2002) demonstrated that supraliminal priming has an effect on the product choice. This is in line with the findings in this study. They used visual priming, whereas this study only uses textual priming. It seems also interesting to investigate the possibilities of visual supraliminal priming and if this strengthens the textual supraliminal priming.   No significant effect of subliminal priming was found, which is not in line with the literature.

The significant effects of supraliminal priming could be explained because of the research design. The participants were exposed to primes when they had to perform tasks that were cognitively challenging. Because of the cognitive effort that the participants had, they were well aware of the video used in this study. Because of the high awareness they had, participants were affected by the primes. Contrary to other studies, the stimulus exposure of the experiment was 125 seconds, in this duration significant effects were found. This offers promising insights for further research. The results concluded that supraliminal priming had a significant effect on attitude and the interaction of subliminal- and supraliminal priming had a significant effect on attitude. The research of Weingarten et al. (2016) showed that the effect of priming depends on valuation of the subject at hand, this would mean that the effects are stronger when the value is higher. The significant effects could be explained in the way that supraliminal primes were processed, which shows that green behaviour has a higher value among the audience, therefore the supraliminal priming effects were significant.

As improving green behaviour is an ethical issue, supraliminal priming could have reinforced negative thoughts and feelings towards behaviour. When people feel pressured morally to change their behaviour to eventually buy green products, but are unwilling or unable to do so, negative effects of priming could be explained. Hereby, it could be explained that positive subjective norms in a subliminal priming condition, lead to a lower mean of generativity. This could indicate that social influences are negative about generativity, which influences the choices of participants. This would be in line with prior research, which states uncongenial information elicits counter arguing, which causes primes to be processed more deeply and memorable than congenial primes (Marquis, 2007). In this case, priming words that are positively related to green products form uncongenial information for people with negative social influences. Therefore, counter arguing could have been evoked which could have caused counteractive effects of priming. This could also be explained by the Reactance Theory, which is concerned with how people react when their freedom to choose is restricted. The theory explains how 'threatened' behaviour becomes more attractive by restriction (Lessne & Venkatesan, 1989).

As mentioned, a lack of more effects could be that people have an assumption about green products and the effect of green products. Some participants felt the need to defend their choices to not purchase green products and doubted the positive effects of green products. The arguments were that they have the opinion that prices of green products are too high, and the effects of green products are not clear and even doubtful. It was interesting that no prices were shown and no information about the possible positive effects of green products were given. With this knowledge and the comments of participants after the experiment, it can be concluded that participants had prejudices regarding the green products, this could have subverted the priming effects.

In order to investigate whether there is an interaction effect of supraliminal and subliminal priming, both conditions were combined. The measure of the interaction effect was carried out because of a gap in the literature. Both conditions were used to measure its effect, but potential interaction effects were not measured. It was expected that combining supraliminal priming and subliminal priming would lead to stronger priming effects. The research concluded that a marginal interaction effect was found.

After conducting the research, there were various respondents that expressed that the price gap between regular products and green products prevents them from buying it. As perceived, behavioural control had no moderating effect on the priming effects, multiple respondents stated that the price differences prevent them from buying green products. This could be explained by the average age of the respondents that was 23.9 years old. Younger people most likely have less money to spend, which could have affected the results. It is likely that responsibilities of purchasing products increase when people get older. Therefore, it seems interesting to investigate the priming effects among an older audience.

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Prior studies were mostly focused on product choice regarding brand choices, these studies were about product choices without a moral factor in it. This research was aimed at changing the product choice of people towards green behaviour, this could be considered as an ethical dilemma. Most people want to improve green behaviour, but they could have reasons for not performing corresponding their behaviour. Various respondents chose not to purchase green products to defend their obligations, for instance, they do not belief in the effectiveness of green products as it was stated by the respondents. The dependent variables in this study were tied to a complex issue, which might have been harder to affect through priming. It is interesting to investigate how priming can affect ethical dilemmas in other settings.

A gap in the literature was found in prior research, therefore it was decided to measure whether subjective norms and perceived behavioural control towards green products could moderate the priming effects towards green behaviour. As it was found by Wang, Liu & Qi (2014) and Ma, Littrell & Niehm (2012) that perceived behavioural control has a significant and positive effect on green behaviour. Armitage and Corner (2001) also stated that perceived behavioural control is a direct predictor of the behaviour and intentions of people. It was expected that perceived behavioural control would have a moderating effect on priming. The study of Herberlein & Black (1976) and Schwartz (1968) found that subjective norms are seen as important predictors for behavioural intention and environmental behaviour. Therefore, it seemed interesting to see if subjective norms moderate the priming effects towards green behaviour. The outcome of this study showed no significant effects of subjective norms and perceived behavioural control on effects of subliminal priming, supraliminal priming and the interaction effect.

No effect of priming was found on generativity regarding green behaviour. As mentioned before, it was found that prejudices regarding green products have occurred during the research. Therefore, it would be important for further research to give insights in the benefits of green products for future generations. By informing people and give insights in the positive effects of green behaviour, prejudices regarding green products can be minimalized. By informing younger people about the effects of green behaviour, they could be concerned with providing care for future generations.

Significant effects of supraliminal priming towards product choice, purchase intention and attitude were found. The findings are interesting as they raise questions in whether changing the research setting could lead to significant effects regarding subliminal priming. For instance, visual priming, priming in a laboratory setting and the duration of the priming video could be tested.

5.2 Implications

The goal of this study was to explore whether subliminal- and supraliminal priming could be used to improve green behaviour by positively affecting the product choices. This study offers important findings. Based on this study, it can be concluded that presenting text primes positively related to green behaviour in supraliminal priming leads to an increase in product choice regarding green behaviour. Subliminal priming does not positively affect attitude, generativity, purchase intention and product choice regarding green behaviour. Therefore, parties who are looking for ways to positively affect green behaviour are advised to explore supraliminal priming furthermore.

In this study, priming effects are significant to affect the behaviour regarding this ethical issue. It is advised to use supraliminal priming as a way to influence people regarding green behaviour. Because the study is about an ethical issue, it is also recommended that besides influencing the people regarding their behaviour, to study the objections against purchasing green products. By gaining knowledge on this topic, people could be informed in a better way about these products, and they will make a well-informed decision.

There should be more insights in the benefits of green products. For instance, when buying a green product, information should be presented on how these products will have an impact and what the positive consequences of the products will be. This will justify why these products are more expensive and people will be well informed when making a decision, while taking the green behaviour into account. Therefore, it is recommended to inform respondents about benefits of green products to justify price difference perceptions of the respondents.

This research provides evidence that the use of supraliminal priming has positive effects on green behaviour. As it was found that supraliminal priming significantly affects product choice, purchase intention and attitude towards green behaviour, it is interesting to explore if supraliminal priming can be implemented in other fields. For instance, it could be tested if the use of supraliminal priming in apps will also has an influence, and the influence of supraliminal priming on websites can be tested. For companies, it is recommended to investigate the use of supraliminal priming into their advertisements and to implement supraliminal priming on their website. To implement these primes, there should be a pre-study to investigate how these primes will be used and which words are being used. Also, the use of visual priming could be interesting, a study towards the effect of visual supraliminal priming is advised.

As for theoretical implications, despite of the limited research on interaction effects and priming through video, a significant effect of supraliminal priming was found. Also, the descriptive statistics show patterns that the use of priming has a promising effect on green behaviour. As mentioned in every condition, the mean score was the highest with supraliminal priming. But almost in every condition, the use of priming led to a higher mean score. Based on these findings, it seems interesting to conduct further research which could expand on the current study and to research the effectiveness of supraliminal priming regarding green behaviour in various fields. Also, the effect of visual supraliminal priming seems interesting for further research.

5.3 Limitations and future research

The study has several limitations that have to be reviewed when performing future research. The study was conducted during the COVID-19 pandemic. Therefore, resources to perform this study were limited. The respondents participated in the experiment online, therefore external influences could not be eliminated. Research rooms were not available due to restrictions regarding the pandemic. To ensure reliability of the results, it is advised for future research to conduct the priming experiment in environments where external influences can be controlled and minimalized. In this research setting, the respondents had to do the experiment in their own houses. By this limitation, it could not be controlled whether respondents were actually looking at the screen while the video of this research was displayed. The results of the research would be more valid and reliable if the research would take place in a laboratory setting where the external influences could be eliminated and minimalized. The setting is controlled, and the researcher could study the behaviour of participants and keep them focussed towards the video.

During this study, it was found that the use of image priming was not feasible due to technical limitations. To use image priming, the images need to be edited with professional editing software and skills are needed to process the images in the way that they are not noticeable. It was concluded by Cooper & Cooper (2002), that image priming is interesting. For future research, researchers are advised to study whether the design of the study could be changed to test whether priming effects can be increased. For example, the duration the of the video can be changed. When the video has a longer duration, more primes could be implemented in the research. Other types of primes could also be adjusted. Also, when the content of the video is longer, there could be more time between the primes. It could be tested if this strengthens the priming effects. It is advised to work with professionals to implement image priming and researching the effects of image priming.

The target audience of this study was 16-34 years old. The mean age of participants was 23.9 years old. Various respondents mentioned that the green products were too expensive for them to consider buying them. They were also doubting the effectiveness of green products. Age could have affected the results, because as people get older, the responsibilities of purchasing products will increase. For future research it is recommended to ensure an even better division of age based on the target audience.

People also made prejudices regarding the green products. Some mentioned that green products were too expensive. The respondents rely on their own assumptions regarding the costs of green products. This is considered as a limitation of this study because no product information such as the prices were given. Various respondents also doubted the positive impact of green products. In future research, product information such as price differences could be provided, information about the effects of green products as well. By showing this information, people will make a well-informed decision instead of relying on their own assumptions. This would increase the reliability because potential effects of incorrect assumptions will be eliminated from the research. It is also advised study whether priming is suitable to facilitate behaviour changing before conducting a study. A pre-study could be used to identify possible objections. When the thoughts and feelings towards a topic are mapped, this could be used by the researcher in constructing a research design. In the case of this study, assumptions regarding green behaviour could have been counteracted. By mapping these assumptions, the researcher is able to judge if it seems interesting and plausible to study if priming could lead to significant effects.

5.4 Conclusion

The objective of this research was to investigate whether subliminal- and supraliminal priming could positively affect attitude, generativity, purchase intention and product choice regarding green behaviour. The study also investigated whether an interaction effect occurred between the two types of priming and whether subjective norms and perceived behavioural control regarding green behaviour moderated the priming effects. The study is aimed at gaining knowledge in the way priming could be used to support people positively in making green decisions that are in line with their own interest and values. The results of this research show that supraliminal priming has a positive effect towards attitudes, purchase intention and product choice regarding green behaviour.

Effects were found of supraliminal priming on attitude, purchase intention and product choice. Furthermore, an interaction effect was found on attitude, this concludes that subliminal and supraliminal priming strengthens the priming effect in this condition. Therefore, this study concludes that the supraliminal primes were effective in supporting people to make choices that support their green behaviour. The descriptive statistics also show a promising pattern in the effectiveness of supraliminal priming. The descriptive statistics also show that supraliminal priming has the biggest effect in every condition. The study offers valuable insights, implications and suggestions for further research. The study shows that supraliminal priming through video content could be successfully implemented in supporting people to make choices that support their green behaviour. Further research towards the interaction effect is needed to conclude if the interaction effect could be used to support people in making choices that support green behaviour. In conclusion, this study provided evidence that green behaviour can be affected by the use of supraliminal priming as supraliminal priming positively influences attitude, purchase intention, product choice regarding green behaviour.

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Appendix A

Attitude: Attitude is the degree in which people appreciate green products.

Items Attitude	Scale
I think it is important to use green products	1 = Totally disagree
	5 = Totally agree
I think it is good to buy green products	1 = Totally disagree
	5 = Totally agree
I think there should be more green products	1 = Totally disagree
	5 = Totally agree
I think it is good that people buy green products	1 = Totally disagree
	5 = Totally agree
I think that more regulations are needed to support people to buy green products	1 = Totally disagree
	5 = Totally agree
I think people have too little awareness regarding the importance of green products	1 = Totally disagree
	5 = Totally agree

(Leiserowitz, Maibach, & Roser-Renouf, 2010)
(Whitmarsh, 2009)
(Leviston, 2013)

Subjective norms: The degree in which my environment supports the use of green products.

Items subjective norms	Scale
People who are important to me think I should use green products	1 = Totally disagree
	5 = Totally agree
I believe that my family expects me to use green products	1 = Totally disagree
	5 = Totally agree
I believe that my friends expects me to use green products	1 = Totally disagree
	5 = Totally agree
I believe that society expects me to use green products	1 = Totally disagree
	5 = Totally agree
People who influence my decisions think I should use green products	1 = Totally disagree
	5 = Totally agree
People whose opinions I value think I should use green products	1 = Totally disagree
	5 = Totally agree

(Yoon, Kyle, van Riper, & Sutton, 2010)
(Azjen, 1991)

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Perceived behavioural control: Perception of the difficulty enacting a behaviour

Items perceived behavioural control	Scale
I can afford to pay more for green products if I want to	1 = Totally disagree 5 = Totally agree
I know where I can buy green products	1 = Totally disagree 5 = Totally agree
I find it hard to buy green products	1 = Totally disagree 5 = Totally agree
I have the possibility to buy green products	1 = Totally disagree 5 = Totally agree
Whether I buy green products is my own decision	1 = Totally disagree 5 = Totally agree
I am confident that I can buy green products	1 = Totally disagree 5 = Totally agree
I have the knowledge to buy green products	1 = Totally disagree 5 = Totally agree

(Yoon, Kyle, van Riper, & Sutton, 2010)

(Azjen, 1991)

Purchase intention: Willingness to buy a green product

Items purchase intention	Scale
I intend to buy green products	1 = Totally disagree 5 = Totally agree
I am willing to buy green products	1 = Totally disagree 5 = Totally agree
I intend to buy green products on a regular basis	1 = Totally disagree 5 = Totally agree
I am willing to buy green products from now on, instead of the products I usually buy	1 = Totally disagree 5 = Totally agree
I intend to buy green products in the near future	1 = Totally disagree 5 = Totally agree
If I have the choice between buying a green product or a non-green product, I would buy the green product	1 = Totally disagree 5 = Totally agree

(Leiserowitz, Maibach, & Roser-Renouf, 2010)

(Azjen, 1991)

(Leviston, 2013)

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Generativity: Ability to transcend personal interests to provide care and concern for future generations.

Items Generativity	Scale
I believe buying green products improves the world for future generations	1 = Totally disagree 5 = Totally agree
I believe green products are essential for the future	1 = Totally disagree 5 = Totally agree
I believe buying green products improves the environment for future generations	1 = Totally disagree 5 = Totally agree
I believe I influence the future by buying green products	1 = Totally disagree 5 = Totally agree
I feel guilty for future generations if I do not buy green products	1 = Totally disagree 5 = Totally agree
I believe improving the world for future generations by buying green products is more important than my own interest	1 = Totally disagree 5 = Totally agree

(Davide & Passini, 2015)

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Appendix B

Words	Frequency	Rankings	
Duurzaam(heid)	10	Duurzaam(heid)	1
Groen	7	Klimaatvriendelijk	2
Milieubewust	4	Groen	3
Biologisch	4	Energieneutraal	4
Klimaat(vriendelijk)	4	Groene energie	5
Ecologisch	4	Milieubewust	6
recycelen	4	Elektrisch rijden	7
CO2 reduceren	2	Ecologisch	8
Kwaliteit	2	Natuur	9
Energieneutraal	2	Biologisch	10
Groene energie	2	Milieu	11
Beter leven	2	Afbreekbaar	12
Minder plastic	2	Gasvrij	13
Natuur	2	Ethisch	14
Afbreekbaar	2	Organisch	15
Betrouwbaar	2	Klimaatneutraal	16
Fair trade	1	Recyclen	17
Bewust	1		
Natuurlijk	1		
Organic	1		
Zuinig	1		
Zuinig	1		
Levensduur	1		
Winstgevendheid	1		
Schoon	1		
Minder plastic	1		

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