Erasmus University Rotterdam

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Master Thesis – Marketing

The Power of Sequence: Investigating Photo Upload Order and Its Influence on Online Review Language

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Abstract

This thesis investigates if the sequence in which users complete the tasks of writing reviews and uploading photos affects the linguistic quality and perceived helpfulness of online reviews. The data was collected through two online surveys with a total of 272 responses after data cleaning. In the first study, participants were asked to write a review and upload a picture. These two tasks were randomized in different orders. The sentiment, perceptional language, and the number of words in the reviews were analyzed using the Linguistic Inquiry and Word Count (LIWC) software. In the second survey, the similarity and helpfulness of the reviews were measured using human judges for both conditions. The statistical analyses of the Kruskal-Wallis test and one-way ANOVA were used to compare the results between the two conditions. The analyses revealed no statistically significant differences. These findings suggest that the sequence of writing a review first or writing a review second does not significantly affect the language, in particular the sentiment, perceptual language or the length in the reviews. The analysis also suggests that users do not find reviews more similar or helpful when you upload the photo before or after uploading a photo.

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1. Introduction

Consumer perceptions and behaviors are shaped by both the text and the pictures in the online reviews. A recent study suggests that in the US 70% of the people have read online reviews before buying electronics (Statista, 2022). Online reviews provide Important information about quality and reliability of products and services. These evaluations are an important source of information that effects purchasing decisions, which makes consumer pick out products that suit them best (Ismagilova et al., 2017). Furthermore, the addition of images in the written online reviews allows for visual context, which makes consumer feedback more trustworthy. According to Wu et al. (2020) online reviews become more helpful when visual content is together with the written reviews because of their informative nature.

Some websites ask their users to upload a photo first before they can write reviews (e.g., Amazon), while on others, users can write their reviews first and upload photos afterward (e.g., TripAdvisor). Does the order in which users complete the tasks of writing reviews and uploading photos affect the online review content? More specifically, the linguistic quality and perceived helpfulness of online reviews? If that is true, what are the reasons behind this phenomenon? This paper seeks to explore the relationship between the sequence in which consumers evaluate products and services, and upload accompanying photos, and its impact on the language used in online reviews.

Understanding how the sequence of consumer actions influences online review sentiment can hold important implications for businesses that want to increase their online reputation and gain more consumer trust. For example, positive online reviews greatly heighten the chances of consumers having an inclination towards a product or service (Vermeulen & Seegers, 2009). Brand managers can comprehend how the design of review writing process affects the use of language in online reviews so that they may create strategies on how to manage and enhance brand perception in a better way through digital spaces.

Investigating the impact of sequence of writing the review first compared to writing the review second is also academic relevant, because this research contributes to the existing literature about online reviews. The sequence effects on online reviews are unexplored and the sequence effects on behavior in general has not been thoroughly explored. The study provides new insights on this subject by filling in these gaps.

2. Theoretical background

This chapter reviews the relevant theories and background using academic literature. Consumer evaluation will be explained first to better understand online reviews. Afterward, the use of language in online reviews will be examined. Then, the use of photos in online reviews will be explored. Furthermore, the connection between language and photos will be analyzed. Finally, the hypotheses for this study will be developed.

2.1 Consumer evaluation

2.1.1 Online Reviews

Since the start of communal interaction, word-of-mouth (WOM) is known as a significant channel for the transfer of information (Godes & Mayzlin, 2004). WOM is a consumer-to-consumer communication channel that can significantly impact consumer behavior. Impressions of products and services can be altered through this channel, motivated by personal experiences and trust (Godes & Mayzlin, 2004). To make purchase decisions, individuals have reliedon friends, family members, and acquaintances for advice as well as opinions (Sundaram et al., 1998).

With the onset of the internet and social media, the landscape of word-of-mouth has shifted dramatically. Electronic word-of-mouth (eWOM) is a type of online communication in which people express their ideas or experiences about various products with the aim of influencing others. Social media, review websites, forums, and blogs have emerged as the main avenues for eWOM, increasing the reach and speed with which information is shared. Based on previous findings, consumers perceive eWOM as more dependable and compelling than traditional media (Dviso, 2010).

2.1.2 Impact of Online Reviews on Consumer Behavior

Consumer evaluation is one of the most crucial factors in shaping consumer behavior and influencing purchasing decisions. Online reviews significantly impact consumer behavior and purchase decisions. It has been established that the number of evaluations as well as the average star ratings have an impact on book sales (Chevalier & Mayzlin, 2006). The number

of online reviews also has a positive impact on the purchasing intention of consumers (Lee, 2019).

Online reviews do not only impact consumer behavior for products but also for services. Vermeulen and Seegers (2009) found that positive (vs. negative) online reviews can significantly increase the likelihood of consumers considering a hotel for their stay. Mauri and Minazzi (2013) found that the valence of online reviews impacts consumers' purchase intentions in the hospitality sector. These shifts in attitude have an impact on sales. Positive online reviews increase sales and negative online reviews decrease sales (Rui et al., 2013).

2.2 Language in online reviews

Language has several functions in the reviews placed online, each having different effects on the perceptions and behaviors of the consumers. There are three types of effects according to the attitudes research: cognitive, affective, and behavioral. These categories make up the ABC Model of Attitudes. This model, often known as the tri-component model, is one of the basic frameworks in psychology that distinguishes three key aspects of attitudes (Eagly & Chaiken, 1998). For instance, the affective part relates to what someone feels or their emotions towards an object of attitude. The behavioral component looks at the acts or behaviors impacted by a person's attitude. Finally, the cognitive component includes a person's beliefs, thoughts, and information regarding the attitude object. These three components work together to build an individual's attitude towards different items, individuals, events, or situations. This gives us an elaborate overview of how they are formed and manifested (Solomon, 1996).

2.2.1 Cognitive Effects of Language in Online Reviews

Language is a significant factor in online reviews that can shape the cognitive processes of consumers. This can impact the perceptions and evaluations of different products and services. Consumers tend to be involved in their thought processes, such as processing information, making evaluations, and selecting the best option when they are writing an online review (Mudambi & Schuff, 2010). The sentiment, readability, or specificity of

language that is recorded in these reviews plays a big role in these cognitive activities (Park et al., 2021).

In online reviews, cognitive aspects of language are examined by researchers through reviewing the semantics of review content. As an illustration, Hu & Liu (2004) analyzed online reviews semantically using sentiment analysis techniques and realized that product quality and satisfaction level by users depended on the choice of words. Similarly, Ghose and Ipeirotis (2011) explored the impact of review content on sales and consumer behavior and found the significance of linguistic cues in shaping consumer decisions.

The cognitive components include the information processing of online reviews and their structures. The way in which reviews are structured, such as through the use of clear headings and bullet points, enables readers to process information better, thereby increasing its informativeness and trustworthiness (Mudambi & Schuff, 2010). Besides, how readable, and specific a review is affects consumers' understanding of it as well as its capability of extracting important data, hence determining decision-making. It has also been found that reviews with higher readability and specificity have a tendency to be perceived as much more useful and informative by consumers (Fang et al., 2016; Mudambi & Schuff, 2010).

According to Bosman et al. (2013), the longer the text in reviews, the more credible and helpful it seems. However, consumers may find them too overwhelming due to the amount of information presented in longer reviews that affects cognitive load. In turn, consumer perception of concise, well-organized reviews is that they are more manageable and therefore easier to process. Therefore, it is important to know how language affects people's minds when looking at online reviews for businesses aiming to improve their customer relationships and affect customer buying behavior.

2.2.2 Affective Effects of Language in Online Reviews

The language used in online reviews not only has an impact on how people think but also how they feel. These emotional and cognitive processes influence the purchase decisions of the customers. According to Chevalier and Mayzlin (2006), emotionally charged language

such as happiness, enthusiasm, irritation, or displeasure can considerably shape customer attitudes and behaviors.

When consumers feel positively about products, they tend to buy more whereas when there are negative feelings, they may end up having second thoughts on buying. A favorable perception can drive up purchase intentions while an unfavorable one can mean discouragement from making purchases. For example, when people write reviews, the sentiments they convey may influence perceptions of a product or service which in turn affect their overall rating and whether or not they will make a purchase (Mudambi & Schuff, 2010; Park et al., 2021). Pang and Lee (2008) applied the sentiment analysis technique in order to identify emotional cues embedded in reviews noting that the emotional language used has profound effects on readers' perceptions and subsequent buying behavior. Moreover, whenever customers leave an emotionally loaded review, it influences how shareable or memorable such a review becomes within social platforms thus shifting its virality rates. Consumers are likely to share and remember reviews that have emotional content, which increases their influence on the consumption choices made by purchasers (Berger, 2013; Berger & Milkman, 2012). Furthermore, Liu et al (2012) established empathy to be evoked by emotions reflected through reviews which leads to an increase in trust levels from other consumers.

It is important to understand the implications of language in online reviews, to maintain a positive online reputation and build good relationships with their target customers. As stated by Hu et al. (2019), emotional resonance is fundamental when it comes to online communication since customer beliefs and actions are heavily influenced by emotive words. Businesses can increase brand loyalty, and engagement among customers and also increase sales by using language effectively in online reviews (Chevalier & Mayzlin, 2006). For instance, (Zhu et al., 2020) pointed out that when a review is read by potential buyers and they feel that it resonates well with their emotions, they are more likely to buy the product. Furthermore, firms can leave lasting and meaningful impressions on consumers through effectively crafted evaluations that generate good feelings such as joy and excitement (Berger & Milkman, 2012). Moreover, Wang et al. (2022) discovered that when people post individual opinions about products on social media, they may indirectly influence other

users' decisions by creating an impression of reliability around these posts. Therefore, if businesses put emphasis on emotive language use in their online evaluations, they would be able to create meaningful bonds between themselves and their customers, thereby standing out from competitors and maximizing profits.

2.2.3 Behavioral Effects of Language in Online Reviews

Online reviews not only have an effect on the thinking process and feelings of consumers, but the reviews can also influence their behavior. Different elements of language can be used to better understand the effects of online reviews on consumers' behavior. For instance, Packard and Berger (2017) argue that explicit or implicit language choices affect the shopping decisions of the reviewers. Persuasive language also plays an important role in determining consumer engagement and purchase decisions. Massaro et al. (1988) emphasized the importance of persuasive language, arguing that it can be used to change attitudes hence its possible consequences on consumer behaviors through online reviews.

It cannot be overstated how much language styles can affect user interaction. A recent study examined how online user engagement is influenced by linguistic features such as tone, level of formality, and complexity (Munaro et al., 2024). Their results also emphasize the importance of matching language styles with target audiences for the purpose of promoting interaction and increasing engagement with online materials. Moe and Trusov (2011) found a relationship between review length and engagement. According to their research, longer and more detailed reviews tend to receive more likes, comments, and shares. Zhu and Zhang (2010) investigated linguistic variables such as verbosity and discovered that reviews with different language styles attract more attention and interaction from users. In a study about temporal dynamics in online reviews, it was discovered that reviews with more engaging and storytelling components are shared and mentioned more often over time (Lee & Bradlow, 2011). There are also other behavioral aspects like social influence and review dynamics. According to Racherla & Friske (2012), persuasive language increases the review's influence on other users because it plays a key role in determining how people pay attention to reviews on social media.

The analysis of the language used in online reviews is important for many businesses in a bid to help them understand how consumers make choices and behave. An assessment of real-life cases where companies have enhanced their sales approach based on the language used in online reviews can be really helpful in making actionable annotations on linguistic distribution. Micu et al. (2017) discussed that sentiment analysis tools can be used to get more information about customers and tailor a fitting marketing strategy. Marketing managers can gain practical insights into how they can effectively leverage language in online reviews to drive consumer behavior and achieve business objectives.

2.3 Photos in online reviews

2.3.1 The Rise of Photos in Online Reviews

In the past few years, there has been an increase in smartphone users. From 2019 to 2024, smartphone users have grown by 114.97 percent leading to a total of 4.88 billion users this year (Statista, 2024). Smartphones have become convenient devices for taking and sharing pictures due to their increased popularity over the years. This increases the chances of having more images in online reviews. As a result, attaching images to written reviews has become a widespread practice that greatly influences online platforms. Currently, different review platforms are encouraging reviewers to append pictures to their text-based evaluations. For instance, Amazon urges those who post comments about products on its site to add a picture explaining that visual representations provide more relevant information than words alone do for consumers' decision-making processes.

2.3.2 Effects of Photos in Online Reviews

The inclusion of images in online assessments can increase the perceived usefulness of these evaluations. Moreover, when visual material fits closely with the textual content, this increases the overall perception of both its trustworthiness and information relevance (Li et al., 2021). Such a combination leads to a deeper understanding of the reviewed goods or services, which can affect how buyers behave by making the review more convincing and trustworthy (Ceylan et al., 2023). For instance, a review of a particular restaurant's meal with photographs could give better indications of qualities like portioning and presentation which could go a long way in influencing the choices made by those intending to visit. Lin et

al. (2012) argued that people see blogs including pictures as more trustworthy than related articles without any visual attributes.

Among other findings, Lin et al. (2012) established that when individuals were exposed to eWOM content on search products that were accompanied by images, there was a marked increase in consumers' product interest and buying intentions. Such findings are relevant not just for experience but also for hedonic products. One of the significant aspects contributing to how online reviews impact customer buying decisions is the use of images within the reviews (Mo et al., 2015). Photos serve as evidence through visuals, which provide customers with real-time evidence about the features, performance, and quality of an item. Correspondingly, customers are more likely to believe online evaluations featuring food photos than reviews without them since the images visually convey the restaurant product's specific features (Park et al., 2021). This shows that photos are important sources of visual information that affect consumers' perceptions of reviews' credibility.

2.4 Photos and language

2.4.1 Influence of Visual Content on Language in Online Reviews

The use of visual content in online reviews can change the language used in online reviews. The alignment between visual and textual content makes the reviews more coherent and credible (Zinko et al., 2019). When reviewers describe what is portrayed in their photos, the textual content becomes more aligned with the visual content. This makes reading easier as well as making it much more useful. A study by Feiereisen et al. (2013) supports this behavior by showing that visual content in reviews makes the language used more descriptive and sensory-rich.

It has been noted by Ceylan et al. (2023) that the total number of characters used to write a review containing photos is greater than that of a review without any photos. Such text lengthening could happen due to more specific and thorough descriptions seen in these visuals. Moreover, different image parts can influence the way these reviews are written depending on their emotional tone or direction. For instance, pictures may induce emotional reactions that are incorporated by reviewers into their stories. Staats and Lohr

(1979) remarked that visual imagery can stimulate feelings, which are reflected in the language in the reviews. For example, pleasant photos featuring pleasurable moments may cause excited and affirmative reviews while unpleasant ones bring forth more critical as well as unsatisfying remarks.

2.4.2 The Impact of Photo Upload Order

Chen et al. (2022) did research on how the sequence of rating and tipping affects consumer behavior. Their research revealed that consumer behavior changed after they switched the order. It showed that rating a service professional first, lowers the number of tips that follow. Against this background, one may wonder whether the sequence in which consumers upload photos and write online reviews can change the language of reviews.

We argue that if consumers upload photos before writing their reviews, they may be influenced by the visual content they have uploaded. The consumer's language might be more descriptive, as they may refer directly to elements or details depicted in the photos. Research has shown that similarity evaluations are an essential aspect of human functioning (Markman & Gentner 1993). This can make the reviews longer and more sensory and perceptual compared to reviews written before taking photos.

The order of uploading photos and writing reviews can also affect the tone and emotional content of the reviews. According to Staats and Lohr (1979), imagery affects behavior by eliciting an emotional response. For instance, if consumers upload positive photos highlighting enjoyable experiences, they might be more inclined to write positive reviews with enthusiastic language. Conversely, if the photos depict negative experiences, consumers might use more critical or disappointing language in their reviews. That the order may change the language and sentiment of online reviews is important to research as it can indirectly affect consumer behavior related to sales like likelihood to buy and consideration.

2.5 Hypotheses Development

In a study carried out by Robinson et al. (2003), it was found that the order in which information is presented is critical for understanding and remembering it accurately. This

study shows that the way people understand and use information depends on how it is presented visually and textually. When this idea is applied to online reviews, it could mean that users who upload photos before writing their reviews could change the review quality. A study conducted by Chen et al. (2022) also gives important insights about how the change in action sequence affects consumer behaviors, particularly in the context of rating service professionals based on the amount the customers tip. By looking at the influence that the sequence of ratings has on tipping behavior, this work reveals the complexity of decision-making process among consumers. Hence there will be similarities with our interest in regard to sequential activities in online reviews as well as picture posting online.

2.5.1 Sentiment Analysis

Pictures and other visual stimuli can trigger affective responses and drive cognitive processes to adopt the language used in online reviews. Positive imagery, according to Staats and Lohr (1979), initiates approach responses. That is why the customers could have perceived and evaluated the reviewed products or services more positively. Also, the activation of sensory-perceptual information by means of visual stimuli can influence consumer-review language style and content (Intons-Peterson & Roskos–Ewoldsen, 1989). As noted by An et al. (2020), if individuals experience more positive occasions than negative ones, they are likely to take more photos. This finding suggests that reviews with photos uploaded by users are likely to contain more positive information. Consequently, users who upload photos before writing reviews may upload photos that predominantly show positive experiences. This effect can change the tone of the reviews positively. Therefore, we hypothesize that consumers who write online reviews before pictures are uploaded will write significantly more positive reviews than those who do so after uploading photographs.

H1: Consumers who write reviews after (vs. before) uploading accompanying photos will write significantly more positive reviews.

2.5.2 Sensory and Perceptual Language

Robinson et al. (2003) found that the presentation order of information impacts how well it is processed and recalled. The change in sequence involving visual stimuli, may influence the language that is used in online reviews. Positive photos have been known to elicit approach

responses that could affect language use (Staats & Lohr, 1979). Motivated reasoning may lead individuals to interpret evidence selectively to justify their preferred conclusion, which influences the language being expressed (Kunda, 1990).

Images have the capacity to evoke or be linked with sensory-perceptual details like weight, color, brightness, and numerosity (Intons-Peterson & Roskos–Ewoldsen, 1989). In simpler terms, images are susceptible to cognitive influence, which may lead to differences in sensory and perceptual language in reviews. Therefore, we hypothesize that reviews written after uploading accompanying photos, will contain more sensory and perceptual language compared to those written before uploading photos.

H2: Reviews written after (vs. before) uploading accompanying photos contain more sensory and perceptual language.

2.5.3 Length of Online Reviews

Images have been found to evoke positive emotions that may lead to approach responses, potentially prompting individuals to provide more detailed descriptions (Staats & Lohr, 1979). In particular, pictures can make you remember sensory details (Intons-Peterson & Roskos–Ewoldsen, 1989). This can make you add more information to your review, which increases the review length.

There are also visual markers that could be particularly important to arrange memories in a narrative way according to research done on narrative psychology by Schank and Abelson (1995). These researchers also suggested that people are more likely to remember and arrange their memories better when prompted by visuals and this increases the details of narrations. Photographs can function as narrative triggers, making it possible for reviewers to connect the dots among ideas into one cohesive story or chain of events. This can make the online reviews longer and more organized. Against this background, we propose that consumers who write reviews after uploading accompanying photos, and thus may be motivated by positive emotional responses triggered by the imagery, will write longer reviews compared to those who write reviews before uploading photos.

H3: Consumers who write reviews after (vs. before) uploading accompanying photos will write longer reviews.

2.5.4 Similarity and Helpfulness

The sequence in which people write the review before or after uploading a photo, can also affect the readers of the reviews. Visual cues like photographs are a significant factor in lightening cognitive loads and improving memory retention (Sweller, 1988). With an image before a review is written, people can have a clear visual reference that helps remember particular details about the product or experience. Reviewers may miss sensory perceptions if they rely on their imagination only. By heightening sensory perceptions, this would enable them to write better reviews that describe images accurately to match descriptions provided in reviews (Intons-Peterson & Roskos–Ewoldsen, 1989). Visual prompts help the reviewers to write more detailed and accurate descriptions (Bower & Clark, 1969), which may increase the similarity between the photo and the review. Furthermore, there are possibilities of users engaging in motivated reasoning when they are uploading photos first with the possibility of selectively interpreting and presenting information in favor of an impression conveyed by a photo (Kunda, 1990). This selective interpretation can result in more consistency between review text and images because reviewers are likely to adjust their narrative so that it fits with the photo.

Several studies have shown that similarity between textual content and accompanying images improves how helpful reviews seem as well as their credibility (Ceylan et al., 2023; Li et al., 2023). When reviewers provide visual anchorages first, chances are high that descriptions may be more detailed and correspond closely to visual evidence thus increasing overall coherence and usefulness. Therefore, we hypothesize that reviews written after uploading a picture will exhibit greater similarity between the textual and visual content compared to those written before the photos are uploaded.

H4: Reviews written after (vs. before) uploading accompanying photos are more similar.

Reviews with photographs are typically more trusted and seen as more believable. The inclusion of images in a review can enhance its perceived authenticity and utility by

providing solid proof that backs up the claims made in the review. A study has established that visualized opinions are more capable of affecting consumer choices positively by increasing trust and perceived authenticity (Karpenka et al., 2021). Pictures assist the readers by making it possible to compare them against actual content leading to better decisions. The importance of such visuals can be specifically recognized if we think about online shopping where purchasers depend on customers' feedback to estimating how nice or exactly fitting any specific item might appear.

When reviews and photos are similar, it increases the perceived helpfulness and usefulness of the reviews (Ceylan et al., 2023). This similarity provides a better narrative, which helps the readers understand the review better. According to Li et al. (2023) user-generated photos (UGPs) significantly drive the helpfulness of the reviews. When consumers upload the photo first, the similarity can increase. Because similarity is positively correlated according to the previously mentioned papers, uploading the photo first also increases the helpfulness.

H5: Reviews written after (vs. before) uploading accompanying photos are significantly more helpful.

3. Data and methodology

Data collection

In this chapter, the data and methodology will be discussed. In the first part the design of the research will be discussed. Then the structure and the collection of the data will be discussed. The third part consists of explanations of the measurements and variables. Lastly the analyses for this paper will be described.

3.1 Research Design

This study aims to understand if the sequence in which users complete the tasks of writing reviews and uploading photos affects the linguistic quality. It is also important to know if the sequence affects the perceived helpfulness or usefulness of online reviews. In order to evaluate if there is an effect quantitative research is used. Because the purpose of this study is to determine if the effect is causal between the independent and dependent variables, an experimental design is the most fitting choice. This is a between-subjects experimental design because it minimizes the risk of potential learning effects. The design increases the quality of the responses by decreasing the possible fatigue and boredom. To assess the hypotheses two experiments were conducted. The first study investigated whether the change in sequence influences linguistic quality. The second experiment focused on perceived helpfulness, usefulness, and similarity by utilizing human judges.

3.2 Research Structure & data collection

This study consists of two experiments, which were both conducted through an online survey. These questionnaires were made with the help of an online survey tool called Qualtrics. Qualtrics is a platform where you can design a survey and collect the data. The experiments were distributed digitally through a link, which would bring you to the survey. The participants were gathered by sharing the survey through Prolific. Prolific is a platform that is known for having a fast response rate. This platform also helps us to decrease certain biases, because the respondent pool is much more diverse and higher in quality (Peer et al., 2017).

Study 1:

The first experiment was conducted through a survey. The survey starts with an introduction text in which they consent. On the next page, I included an attention check, which was designed to identify inattentive participants. In the third phase, participants were randomly assigned to one of two conditions in a two (sequence: review first vs. review second) between-subjects design. While participants in the "review second" condition were asked to first upload a product picture and then write an online review about their most recently purchased pair of shoes, participants in the "review first" condition were asked to first write a review and then upload an accompanying review. Importantly, participants had to write at least 12 characters for the review. While this number might be on the lower side for a review, it still resembles real-world reviews where there are short reviews. Some platforms even have no minimum number of characters for reviews. After the main task, participants were asked four questions about their habits relating to writing reviews and uploading photos. I also included a question to check if people took the photo during the survey or not. This served as another screener and in order to control for the fact that participants might have used an existing picture. Lastly, every participant was asked to indicate their age, gender, and education.

The requirement for participating in this survey was to do the survey on a phone with a camera available. The screening was done through Prolific. The survey was distributed to people living in the US or in the UK with English as their first language. While this screening of participants lowers the external validity, this increases the internal validity as non-English speakers might not understand the questions or will not be able to write the reviews correctly. This can lead to biases in the results.
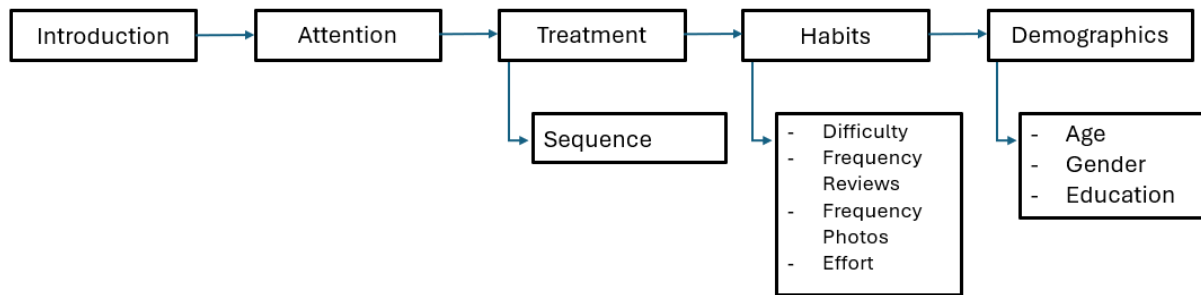
Figure 1: Survey flow

Survey 2:

The second experiment was also conducted through a survey on Qualtrics. An introduction with the consent button is shown to the participants at first. In the main task of the survey, participants saw five randomly drawn reviews with the corresponding photos from the set of reviews collected in Survey 1. All reviews and photos were used after cleaning the data. These evaluations were randomly assigned to the participants. Participants were asked to rate two items related to the usefulness and two items related to the similarity of the reviews and photos on 9-point Likert scales. At the end of the survey, they were asked to fill in their age, gender, and education.

3.3 Measurements

3.3.1 Dependent Variables

Sentiment

The variable 'Sentiment' was analyzed using sentiment analysis tools to determine the sentiment in a review. The numbers from 0 to 50 show the negativity and the numbers from 51 to 100 show the positivity. The higher the number, the higher the positivity. This number is conducted using Linguistic Inquiry and Word Count (Pennebaker et al., 2001).

Perceptual

This variable counts the number of sensory and perceptual language used in the reviews. The score is relative and was conducted using the LIWC software.

Length

The length of the reviews was measured in terms of the number of words. This measurement is also performed using the software LIWC, which simply counts the number of words in the review.

Perceived Similarity and Helpfulness:

In the second survey, participants rated the similarity between reviews and photos as well as the helpfulness of the reviews on 9-point Likert scales (1 = not at all similar, 9 = very similar). I used a 9-point Likert scale here just like the similarity study done by Ceylan et al. (2023). For the variable Similarity the participants were asked two separate questions (Appendix B), which were combined after using a factor analysis. This is also the same for Helpfulness. This variable was measured by asking users the helpfulness (1 = not at all helpful, 9 = very helpful) and usefulness (1 = not at all useful, 9 = very useful) the reviews are.

3.3.2 Independent variables

Sequence

The main independent variable is 'Sequence'. The variable sequence is the sequence in which the survey participants write the evaluation and take the photo. This is a categorical variable with the numbers 0 and 1 depending on the condition. The variable Sequence is 0 if participants were asked to write the review before uploading the photo. This variable is 1 if participants were asked to write the review after uploading the photo.

3.3.3 Control variables

Demographics

Participants were asked to report their ages. They could answer this question by typing their age. Participants reported their gender on a multiple-choice question. They could select the options: male, female, non-binary/ third gender or prefer not to say. Lastly the participants were asked to report their highest level of education completed. This was a multiple-choice question with the options: less than high school, high school graduate, bachelor's degree, master's degree, or doctorate. These demographic questions were used for both surveys. The next control variables were only used for the first experiment.

Difficulty

The participants were asked how difficult writing the review was. The participants indicated the difficulty on a 7-point Likert scale. They could answer the question by sliding a bar ranging from the numbers 1 to 7 (1 = Not at all difficult, 7 = Very difficult).

Review Frequency

The participants were asked how often they write online reviews. The participants indicated the frequency on a 7-point Likert scale. They could answer the question by selecting from the numbers 1 to 7 (1 = Never, 7 = Always).

Upload Frequency

The participants were asked how often they upload photos when writing online reviews. The participants indicated the frequency on a 7-point Likert scale. They could answer the question by selecting from the numbers 1 to 7 (1 = Never, 7 = Always).

Effort

The participants were asked if they consciously made an effort to align the picture and the review. The participants indicated their effort on a 7-point Likert scale. They could answer the question by selecting from the numbers 1 to 7 (1 = Not at all, 7 = Very much).

3.4 Methods of analysis

Linguistic Inquiry and Word Count (LIWC) is a software that counts certain words in a text. This software is a validated tool for analyzing written text and identifying emotional and psychological dimensions (Pennebaker et al., 2001). This analysis tool will help us get data for the variables we want to test in the first three hypotheses. LIWC has a lot of analysis and counting tools inside. We will be using 'Tone' from this software to measure the sentiment for the first hypothesis. LIWC also includes the category related to perceptual language named 'Perception'. The software counts how many perceptual words are used in a text and in our case a review. This was used to test the second hypothesis. As word count is in the name of the software, this also helps us to answer the third hypothesis. This tool is used to

simply count how many words are used in the reviews. When we have the data collected after the survey, we can compare the means of these variables between the different orders of actions. To test if the means are significantly different from each other, one-way ANOVA will be used.

The data from the second survey consists of the four dependent variables Helpful, Useful, Similar-1 and Similar-2. Using a factor analysis, the Similar-1 and Similar-2 variables will be combined into the variable Similarity (Eigenvalue = 1.95). The variables Helpful and Useful will be combined into the variable Helpfulness also using the factor analysis (Eigenvalue = 1.98). The mean of Similarity and Helpfulness for every review will be computed in the SPSS software. Then, we compare the averages using a one-way ANOVA. If the assumptions of the ANOVA analysis are not met, other analyses (depending on which assumptions are not met) like the Kruskall-Wallis test or Welch's test will be conducted. The Kruskall-Wallis test is conducted if only the normality assumption does not hold. If the other assumptions or more than one assumption does not hold, Welch's test will be used.

4. Results

4.1 Data preparation

The data for the first survey was collected on 8th of July. The participants needed around 3-5 minutes to complete the survey. There were 150 responses collected through Prolific (75 for each condition). After removing invalid responses in the data there were 135 responses left. Nine responses were removed from the dataset because the photo was not taken during the survey. Three responses were excluded because they contained either irrelevant or random content and two responses were removed due to the total duration of the survey completion. Lastly, one participant failed the attention check question and was removed from the data. For the second survey a total of 140 responses were gathered. For this data one response was excluded because of the completion time. Two other responses were removed because they did not agree to participate.

4.2 Descriptive statistics

Out of the remaining 137 responses from the first survey, 67 (49.6%) were asked to upload the photo first and 68 (50.4%) were asked to write the review first (Table 1). Because both percentages are close to 50%, we can call the randomization a success. The unusable data removed did not lean towards either group of sequences. For the second survey every review had on average 5 scores. The mean was computed for every review separately for the dependent variables.

Table 1: Participant randomization percentages

Sequence	Frequency	Percent
1	67	49.6
0	68	50.4

4.2.1 Dependent variables

In Table 2 we see the dependent variables for the hypotheses with their minimum, maximum, mean and standard deviation. The average review sentiment was relatively positive (M = 90.97, SD = 17.60). The perceptual language used in the reviews had an average score of 7.91 (SD = 7.34). The variable Review Length shows that the reviews are on

average short (M = 24.50, SD = 21.51). The mean Similarity is 5.40 (SD = 1.18) and the mean of Helpfulness is 5.56 (SD = 1.48).

Table 2: Means and standard deviations for Review Sentiment, Perception and Review Length

Variable	Minimum	Maximum	Mean	Standard Deviation
Review Sentiment	1.71	99	90.97	17.603
Perception	0	42.86	7.91	7.338
Review Length	3	146	24.50	21.513
Similarity	2.6	7.4	5.40	1.189
Helpfulness	1.3	8.5	5.56	1.484

4.2.2 Demographics and Behavioral Variables

The data from the first experiment consisted of 50 (37%) males and 65 (63%) females. The highest level of education completed for the participants of this survey is a bachelor's degree with 61 participants (45.2%) and graduated high school with 51 participants (37.8%). There are only 19 participants (14.1) with a master's degree, 2 with a doctorate (1.5%) and 2 who have less than high school (1.5%). The average age for this experiment was 36.45 (SD = 10.14). Most of the participants are between 25 and 45 years old.

For the behavioral variables we see that most people found it not difficult to write the review with a mean of 1.63 (SD = 1.20). The mean of review frequency is 3.06 (SD = 1.33), so on average people write occasionally reviews according to this data. The upload frequency is a bit lower with a mean of 2.09 (SD = 1.11), so people in this dataset rarely upload photos. The effort variable suggests that the participants made moderate effort to align the text and the photo with each other (M = 3.63, SD = 2.15).

Table 3: Descriptive Statistics

Variable	Obs.	Mean	Std. dev.	Min	Max
Difficulty	135	1.63	1.195	1	6
Review Frequency	135	3.06	1.326	1	7
Upload Frequency	135	2.09	1.109	1	6
Effort	135	3.63	2.154	1	7
Age	135	36.45	10.143	19	66
Gender	135	1.63	0.485	1	2
Education	135	2.76	0.765	1	5

4.3 Reliability and Validity

To test all the hypotheses in this research, one-way ANOVA was used. Before this analysis method can be used, the assumptions have to be met. The first assumption is that the samples are selected random and independent. This assumption was met because the participants were random and independent though prolific. This assumption held for both surveys, thus for all hypotheses.

The second assumption for ANOVA is the homogeneity of variance. That means that the variance between both groups should be the same. To test this assumption, I conducted a Levene's test for homogeneity of variances, which showed non-significant results for the first hypothesis (p = .078). The same test also showed insignificant results for the second (p= .333) and the third hypotheses (p = .885). As a result, I could assume that the variables of the first survey have equal variances. For the second survey we have the fourth and fifth hypothesis. The Levene's test also showed that the results were not significant for Similarity (P = .240)and Helpfulness (p = .239). We cannot reject Levene's test, so that means that we can assume that there are equal variances in both variables.

The third and final assumption is that the dependent variables are normally distributed. To test this assumption, we use the Shapiro-Wilk test. Table 4 shows that the p-value were significant for the first 3 hypotheses. The variables Sentiment (Group 0: p < .001, Group 1: p < .001) and Perception (Group 0: p < .001, Group 1: p = .003) were both significant for both

conditions. The Shapiro-Wilk test also revealed significant results in both groups for Review Length (Group 0: p < .001, Group 1: p < .001). The normality assumption does not hold for the first three hypotheses. Because this assumption is not met, the one-way ANOVA cannot be used. The Kruskal-Wallis test is used to compare the means, which is a non-parametric test that can be used if the normality assumption does not hold for the ANOVA analysis (Hodges and Lehmann, 1956).

Table 4: Tests of Normality Study 1

Variable	Condition	Shapiro-Wilk		
		Statistic	df	Sig.
Sentiment	0	.486	62	< .001
	1	.571	55	< .001
Perception	0	.902	62	< .001
	1	.929	55	.003
Review Length	0	.630	62	< .001
	1	.844	55	< .001

In table 5 the normality tests of the fourth and fifth hypotheses are shown. The Shapiro-Wilk test shows that the variable Similarity tested insignificant in both groups (Group 0: p < .034, Group 1: p < .096). This means that we can use the one-way ANOVA for this hypothesis because the normality assumption holds. The fifth and last variable Helpfulness is significant in both groups (Group 0: p = .026, Group 1: p = .037). This means that we cannot use the one-way ANOVA for this variable and have to use the Kruskal-Wallis test.

Table 5: Tests of Normality Study 2

Variable	Condition	Shapiro-Wilk		
		Statistic	df	Sig.
Helpfulness	0	.959	67	.026
	1	.962	68	.037
Similarity	0	.980	67	.342
	1	.970	68	.096

4.4 Analysis

4.4.1 Hypothesis 1: Sentiment

The first three hypotheses can be tested with the results of the first survey. The first hypothesis is that the consumers who write reviews after (vs. before) uploading accompanying photos will write significantly more positive reviews. To test this hypothesis a Kruskal-Wallis test is used. The results revealed that participants in the "review first" condition showed higher sentiment (M = 92.36, SD = 15.859) compared to participants in the "review second" condition (M = 89.40, SD = 19.411). A Kruskal-Wallis test revealed that the difference is not statistically significant ($\chi 2(1) = 0.202$, p = 0.327).

4.4.2 Hypothesis 2: Perception

To test the second hypothesis a Kruskal-Wallis test is conducted. The hypothesis is that reviews written after (vs. before) uploading accompanying photos contain more sensory and perceptual language. The results revealed that the participants in the "review first" condition showed higher rates of perceptual language (M = 8.05, SD = 7.471) compared to participants in the "review second" condition (M = 7.77, SD = 7.258). The results of the Kruskal-Wallis test indicated no statistically significant difference ($\chi^2(1) = 0.202$, p = 0.483).

4.4.3 Hypothesis 3: Review Length

The third hypothesis is tested with Kruskal-Wallis test. The hypothesis is that consumers who write reviews after (vs. before) uploading accompanying photos will write longer reviews. The results revealed that the participants in the "review first" condition wrote shorter reviews (M = 24.24, SD = 23.989) compared to participants in the "review second" condition (M = 24.76, SD = 18.935). According to the Kruskal-Wallis test, the difference was not significantly between the two groups ($\chi 2(1) = 0.235$, p = 0.314).

4.4.4 Hypothesis 4: Similarity

For the fourth and the fifth hypothesis we use the data from the second survey. The fourth hypothesis is that reviews written after (vs. before) uploading accompanying photos are more similar. To test the similarity a one-way ANOVA was used. The results showed the "review first" group indicated a lower similarity(M = 5,36, SD = 1.065) compared to the

"review second" group (M = 5.44, SD = 1.189). A One-Way ANOVA revealed that the difference is not statistically significant (F(1, 135) = 0.175, p = 0.676).

4.4.5 Hypothesis 5: Helpfulness

The fifth and last hypothesis is that reviews written after (vs. before) uploading accompanying photos are significantly more helpful. To test this hypothesis, we test the variables helpful and useful. Helpfulness was tested with the Kruskal-Wallis test as it failed the normality test. The mean of helpful when you write the review first (M = 5.55, SD = 1.367) is slightly lower than uploading the photo first (M = 5.58, SD = 1.592). The Kruskal-Wallis test found no significant statistical ($\chi2(1) = 0.119$, p = 0.365).

5. Discussion

5.1 General Discussion

The main goal of this thesis was to research if the sequence in which users complete the tasks of writing reviews and uploading photos affects the linguistic quality and perceived helpfulness of online reviews. Five hypotheses were conducted and tested to answer the main question. This research used the data from two surveys that were conducted for this research to answer the hypotheses. The LIWC software was used to measure the quality of the reviews.

The hypotheses were formulated based on prior research. For the first hypothesis we expected that consumers who write reviews after (vs. before) uploading accompanying photos will write significantly more positive reviews. This was not the case according to the results as the results were not significant. This suggests that the sequence does not influence the positivity in online reviews. We expected perceptual language to be more prevalent in reviews that were written after uploading a picture, compared to writing a review first then uploading a photo. This hypothesis was not supported by the data and analysis as it was not significant. This finding indicates that order of taste does not impact the amount of sensory and perceptual descriptions in online reviews. The third hypothesis was not about what kind of language is used, but simply about how much. We expected that the review would be longer when you write the review after uploading a picture first. The results were insignificant for both sequences; thus this hypothesis is not supported by the data. According to this result there is no difference between the words used in an online review for both sequences.

The expectation for the fourth hypothesis was that the reviews would be more similar when you add the picture first and then write the review. After testing the differences for both sequences the study found no differences between the means. That is because this hypothesis has insignificant results after analyzing the data. This means that according to the results no effect was found in similarity for participants who uploaded the photo before writing the reviews. The fifth and last hypothesis is about helpfulness. We expected that reviews written after uploading accompanying photos are significantly more helpful than

reviews written first. Also, for this hypothesis the results showed that it is not significant. Thus, according to this study there is no effect of sequence on helpfulness.

5.2 Implications

In this section we discuss the implications of this study. There was no significant effect found for all the hypotheses. This means that according to this study there is no effect on language (In particular emotional, perceptual and the length of language), similarity or helpfulness between the two orders of actions. This can allow online review platforms to have more flexibility in how they design the reviewing part of their products or experiences. The users can also receive more flexibility on how they complete the tasks. The focus can be laid on improving the customer experience and engagement without compromising the quality of the content. Marketing and product managers could use these results for interpreting the reviews better. With this knowledge they can assume that the order does not affect sentiment in reviews, make it more perceptual or longer. This means they can look at other variables that can have an effect. This allows for having more confidence in the consistency of the review's contents.

The results could also be biased and there could be an actual significant effect between the means of this study. If that is true, this can have meaningful implications for businesses. Marketing and product managers could leverage this effect of sequences to change consumer behavior. They can increase the positivity of the reviews which will benefit the company and can attract more customers. Businesses can also use this change in sequence to increase the similarity of the reviews and ultimately the helpfulness, as similarity and helpfulness are positively correlated (Ceylan et al., 2023). This can help customers make better choices and be less disappointed in the product or experience they purchase.

5.3 Limitations and Future Research

This thesis has several limitations that should be discussed. One limitation is that the data was a specific demographic group from prolific. While the data is good in quality, it can still limit the generalizability of the findings. Also the reliance on measures which are self-reported might not be accurate. Some people might have trouble remembering and be

subject to recall bias. Furthermore, the minimum number of characters that the participant had to write the review was too low. The minimum characters were 12 and this resulted in some very short reviews. While reviewers often write short reviews on websites, the short reviews are harder to analyze through language tools. Certain words are counted for the analysis, but if there are too few words, the analysis cannot be done accurately. This means that for some of the variables the scores can get really high or really low. The sample size could be larger to increase the power of statistical tests. We had a sample size of 135 for the first and 137 for the second survey. This was sufficient for this doing a meaningful analysis, but a larger sample can provide more reliable and accurate results and decrease the margin of error. There might be other underlying variables that have an effect on the dependent variables, for which has not been accounted. This can lead to errors and biased results.

This research is interesting as the change in order of writing a review and uploading a photo has not been explored before. This is why it contributes to the research and complements it. It is important for future research to address the limitations of this study. One recommendation for future research is to get larger sample sizes for the research. This helps to decrease the errors and increase the internal validity of the findings. Increasing the minimum word count or character count would help analyze the text better. While real world reviews can be really short as well, it becomes much harder to analyze those reviews with linguistic software. That is because this software needs a sufficient number of words to distinguish the differences between texts. Another recommendation is to use a more specific product for the experiment. In this study we used shoes, but there are many diverse types of shoes. This variation can lead to errors and decrease the internal validity of the reviews. The reviewers can write several types of reviews because of the different types of shoes.

The use of a field experiment would make this research more accurate. Using a real website to conduct an experiment where people write reviews on both sequences. When you ask people to write a review randomly on a survey, it is different than in a real-world scenario. Because writing a review is not mandatory and some buyers do not always write a review. These underlying differences would be controlled for by using a real-world review dataset.

Also the number of reviews would increase when you choose a big online website where customers can write reviews.

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Appendix A

Study 1: Upload picture first

Dear Survey Participant:

This survey should take no more than 4-5 minutes to complete. You may only complete the survey once.

Please offer your candid opinions regarding the questions in this survey. We may have some questions to check that you were paying attention to the stimuli and to the other questions being asked. There are no foreseeable risks associated with this project, nor are there any direct benefits to you. This information is anonymous and your identity will not be disclosed to anyone. The data will only be analyzed in aggregate. Your participation is voluntary, and you may withdraw from this project at any time. There is no penalty for doing so, but you will only receive payment if you complete the study.

If you have questions or comments, please contact us via email on prolific. If you want to talk to someone outside of the research team, you may contact the University of Pennsylvania Office of Regulatory Affairs (215-898-2614) with any questions or comments. If you consent to participate in this study, please click "I agree to participate in this study".

I agree to participate in this study	I do not agree to participate
○	○

Thank you for participating!

In this survey, we are interested in **your most recent shoe purchase or gift**. Your feedback is important to us and will help improve our understanding of consumer experiences. This survey will ask you to provide a photo and review of your last pair of shoes and some general questions about your reviewing habits.

Click continue to start the survey.

To ensure you're paying attention, please select 'Prefer not to say' for this question.

I agree	I disagree	Prefer not to say	Other
○	○	○	○

Please write a review of your last pair of shoes you purchased or received.

Please take a photo of the last pair of shoes you purchased or received using your device's camera and upload it here. This photo should be taken during the survey.

Drop files or click here to upload

How difficult was it for you to write the review?

Not at all difficult						Very difficult
○	○	○	○	○	○	○

How often do you write online reviews?

Never	Rarely	Occasionally	Sometimes	Frequently	Very frequently	Always
○	○	○	○	○	○	○

How often do you upload photos with your reviews?

Never	Rarely	Occasionally	Sometimes	Frequently	Very frequently	Always
○	○	○	○	○	○	○

Did you upload a previously taken photo, or did you take a new one for this survey?

○ Previously taken photo

○ Took a new photo for this survey

Did you consciously make an effort take a photo that aligns with the text of your review?

Not at all						Very much
○	○	○	○	○	○	○

What is your age?

[ ]

What is your gender?

○ Male

○ Female

○ Non-binary / third gender

○ Prefer not to say

What is your highest level of education completed?

○ Less than high school

○ High school graduate

○ Bachelor's degree

○ Master's degree

○ Doctorate

Study 1: Write a review first

Dear Survey Participant:

This survey should take no more than 4-5 minutes to complete. You may only complete the survey once.

Please offer your candid opinions regarding the questions in this survey. We may have some questions to check that you were paying attention to the stimuli and to the other questions being asked. There are no foreseeable risks associated with this project, nor are there any direct benefits to you. This information is anonymous and your identity will not be disclosed to anyone. The data will only be analyzed in aggregate. Your participation is voluntary, and you may withdraw from this project at any time. There is no penalty for doing so, but you will only receive payment if you complete the study.

If you have questions or comments, please contact us via email on prolific. If you want to talk to someone outside of the research team, you may contact the University of Pennsylvania Office of Regulatory Affairs (215-898-2614) with any questions or comments. If you consent to participate in this study, please click "I agree to participate in this study".

I agree to participate in this study	I do not agree to participate
○	○

Thank you for participating!

In this survey, we are interested in **your most recent shoe purchase or gift**. Your feedback is important to us and will help improve our understanding of consumer experiences. This survey will ask you to provide a photo and review of your last pair of shoes and some general questions about your reviewing habits.

Click continue to start the survey.

To ensure you're paying attention, please select 'Prefer not to say' for this question.

I agree	I disagree	Prefer not to say	Other
○	○	○	○

Please write a review of your the last pair of shoes you purchased or received.

[text box]

Please take a photo of the last pair of shoes you purchased or received using your device's camera and upload it here. This photo should be taken during the survey.

Drop files or click here to upload

How difficult was it for you to write the review?

Not at all difficult						Very difficult
○	○	○	○	○	○	○

How often do you write online reviews?

Never	Rarely	Occasionally	Sometimes	Frequently	Very frequently	Always
○	○	○	○	○	○	○

How often do you upload photos with your reviews?

Never	Rarely	Occasionally	Sometimes	Frequently	Very frequently	Always
○	○	○	○	○	○	○

Did you upload a previously taken photo, or did you take a new one for this survey?

○ Previously taken photo

○ Took a new photo for this survey

Did you consciously make an effort take a photo that aligns with the text of your review?

Not at all						Very much
○	○	○	○	○	○	○

What is your age?

[   ]

What is your gender?

○ Male

○ Female

○ Non-binary / third gender

○ Prefer not to say

What is your highest level of education completed?

○ Less than high school

○ High school graduate

○ Bachelor's degree

○ Master's degree

○ Doctorate

Appendix B

Study 2:

Dear Survey Participant:

This survey should take no more than 3 minutes to complete. You may only complete the survey once.

Please offer your candid opinions regarding the questions in this survey. We may have some questions to check that you were paying attention to the stimuli and to the other questions being asked. There are no foreseeable risks associated with this project, nor are there any direct benefits to you. This information is anonymous and your identity will not be disclosed to anyone. The data will only be analyzed in aggregate. Your participation is voluntary, and you may withdraw from this project at any time. There is no penalty for doing so, but you will only receive payment if you complete the study.

If you have questions or comments, please contact us via email on prolific. If you want to talk to someone outside of the research team, you may contact the University of Pennsylvania Office of Regulatory Affairs (215-898-2614) with any questions or comments. If you consent to participate in this study, please click "I agree to participate in this study".

I agree to participate in this study	I do not agree to participate
○	○

To what extent is the review above was helpful?

not at all helpful								very helpful
○	○	○	○	○	○	○	○	○

To what extent is the review above was useful?

not at all useful								very useful
○	○	○	○	○	○	○	○	○

What is your age?

[   ]

What is your gender?

○ Male

○ Female

○ Non-binary / third gender

○ Prefer not to say

What is your highest level of education completed?

○ Less than high school

○ High school graduate

○ Bachelor's degree

○ Master's degree

○ Doctorate

Overall, how similar is the information conveyed in the photo to the information conveyed in the text?

not at all similar								very similar
○	○	○	○	○	○	○	○	○

With regards to concrete features and aspects, how similar is the information conveyed in the photo to the information conveyed in the text?

not at all similar								very similar
○	○	○	○	○	○	○	○	○

Example Reviews with pictures:

Review:

Super comfortable and unique because of the different colourways compared to normal trainers. I have received lots of love for these trainers from friends

Review:

The pair of sketchers work shoes are exactly what I needed, they're comfortable to stand on all day at work. They're dirty but that's fine for me

Review:

Good value trainers and have the look I'm going for but, poorly made. The soles get worn quickly and begin to hurt the feet.

Review:

Niver than a boring flip flop. Can be dressed up or own. Great value for money. Feel good quality that will last