

# The Effect of Reviewer Profile Photo on Purchase Decision: Evidence from Event-Related Potentials

Xiaoli Tang and Zhijie Song

School of Economics and Management, Yanshan University, Qinhuangdao, China

## ABSTRACT

Although the number of studies on online reviews is growing, the impact of reviewer photo on consumer purchase decision-making has not yet been examined systematically. In particular, the underlying neural mechanisms have remained underexplored. Thus, the present study investigated whether and how reviewer photos affects consumers to make a purchase decision by using event-related potentials (ERPs). At the behavioral level, participants demonstrated a higher purchase rate with a shorter RT in situations with reviewer photos compared to situations without reviewer photos. Meanwhile, at the neural level, compared with situations without reviewer photos, situations with reviewer photos attracted more rapid attention resources at the early automatic processing phase, which induced a greater P2 amplitude, then mobilized more sustained attention allocation at the cognitive monitoring phase due to its evolutionary significance which elicited a more negative N2 amplitude, and finally resulted in a better evaluative categorization with higher motivational and emotional arousal due to its social presence which evoked a larger late positive potential (LPP) amplitude at the late elaborate cognitive processing phase. Those results illuminated the neural pathway of purchase decision-making when consumers were exposed in different conditions of reviewer photo. Moreover, the current study provided evidence for the underlying influence of reviewer photo on purchase decision-making in online shopping.

## KEYWORDS

online shopping  
reviewer photo  
purchase decision  
P2  
N2  
LPP

## INTRODUCTION

Nowadays, with the rapid development of electronic commerce, consumers in China are used to shop online. Meanwhile, online reviews, the Internet-mediated opinions and recommendations on products and services from other online consumers (Dellarocas et al., 2007), have shown explosive growth recently. Additionally, online reviews have been deemed to be decision-making aids when consumers shop online due to their pivotal influence on consumers' purchase intention (Xie et al., 2011; Doh & Hwang, 2009). Therefore, as one of the most influential sources of information when people make purchase decisions, online reviews have successfully attracted extensive attention from both academics and the public (Huang et al., 2009; Lee & Shin, 2014).

However, it is worth noting that there exists a prerequisite for online reviews to become a purchase decision-making aid. That is, consumers have to trust the reviewers in the first place (Xu, 2014). Previous research has illuminated that reviewer identity disclosure (Forman et al., 2008; Racherla & Friske, 2012) and reviewer profile characteristics (Park et al., 2013) play important roles in establishing confidence, enhancing the helpfulness of online reviews, and facilitating consumers' decision-making in the online shopping environment.

Corresponding author: Xiaoli Tang, School of Economics and Management, Yanshan University, Qinhuangdao 066004, China. E-mail: 934745661@qq.com  
Zhijie Song, School of Economics and Management, Yanshan University, Qinhuangdao 066004, China. E-mail: songzhj@ysu.edu.cn

In particular, the availability of the reviewers' photos could reduce some uncertainty (Park et al., 2013; Xu, 2014). Furthermore, the literature on information systems has long recognized the significance of images in the online context (Cyr et al., 2007; Cyr et al., 2009). Nevertheless, the underlying mechanisms of how reviewer photos contribute to the helpfulness of online reviews, as well as how they subsequently influence purchase decision-making, have not been systematically studied yet (King et al., 2014).

Some prior related studies have generally confirmed the significance of reviewer photos on e-consumers' purchase decision. Specifically, reviewer photos displayed next to the online review, essentially possess visual appeals to draw consumers' attention and to enhance affective responses (Hernández-Ortega, 2014; Karimi & Wang, 2017; Lee & Shin, 2014; Scott, 1994). However, those findings and explanations were confined to the behavioral level. Furthermore, at the neural level, the underlying cognitive mechanisms of reviewer photo affecting purchase decision-making have remained largely underexplored. In addition, neuroscientific methods demonstrate intrapersonal aspects more objectively in contrast to traditional research methods, such as self-reports or behavioral experiments, which were widely adopted in previous studies (Kuan et al., 2014). Thus, the present study takes the literature forward by investigating whether and how reviewer photos influence consumers to make purchase decisions from a behavioral and neurological perspective.

To achieve this purpose, the present study employed event-related potentials (ERPs) technology to reveal the temporal brain activity during information processing and decision-making in online shopping, which has not been commonly used before to investigate the current issue. As an important neuroimaging technique, ERPs have the advantage of high temporal resolution to measure the perceptual and cognitive processing of stimuli within brain activity at relatively low costs (Friedman & Johnson, 2000; Luck et al., 2000). In light of decision neuroscience and neuro-marketing, the cognitive processes which consumers would go through when shopping online to make a purchase decision were coded in three ERP components comprising an early automatic perception phase (P2), a cognitive monitoring phase (N2), and an evaluative appreciation phase (LPP). Then, those three ERP components, which were closely related to temporal cognitive activities, were examined in the present study.

The P2 is an early positive ERP component over the frontal scalp areas (Carretié et al., 2001; Delplanque et al., 2004), which is associated with rapid automatic attention (Correll et al., 2006; Huang & Luo, 2006). In fact, the P2 is considered to be an index of early stimuli assessment (Polezzi et al., 2008) to detect the typical features rapidly (Thorpe et al., 1996). Furthermore, previous studies have consistently suggested that the P2 is sensitive to emotional stimuli (Wang et al., 2012). To be specific, negative stimuli could garner more attention resources automatically and evoke a greater P2 amplitude compared with positive stimuli (Ma et al., 2014; Jin, Zhang et al., 2017). Notably, a larger P2 amplitude could also be elicited for emotional stimuli than for neutral ones (Langeslag et al., 2007; Schacht et al., 2008). More attention resources are mobilized to the former compared to the lat-

ter (Herbert et al., 2006). In light of previous research, in the present study, situations with reviewer photos are deemed as positive stimuli which could prompt participants to feel some positive emotions such as comfort and trust (Hernández-Ortega, 2014; Xu, 2014), resulting in more allocated attention resources and an increased P2 amplitude (Lin et al., 2015) compared with situations without reviewer photos, which may be considered as neutral stimuli.

The N2 is a common negative ERP component over the frontal-central scalp regions (Folstein & Van Petten, 2008; Forster et al., 2010), which is frequently recognized in the cognitive neuroscience domain. A considerable number of studies have reported that the N2 is closely related to attentional orienting to emotional stimuli (Cuthbert et al., 2000), which reflects cognitive monitoring with increased and sustained attention (Folstein & Van Petten, 2008; Van Hooff et al., 2010). Specifically, the more attention resource the participants pay, the higher the N2 amplitude. Additionally, from an evolutionary point of view, relevant information is generally a matter of priority (Van Hooff et al., 2010; Werheid et al., 2007). Furthermore, previous studies have indicated that reviewer photos served as real social entities, leading to more perceived social presence and a greater evolutionary significance (Xu, 2014; Karimi & Wang, 2017). Based on prior research findings, in the current study, we expected that a more negative N2 amplitude would be identified in situations with reviewer photos compared to those without reviewer photos as the former would induce more perceived social presence and attract more attention to monitor cognitively in contrast to the latter.

The LPP is another positive ERP component with a widespread distribution from the frontal to the parietal scalp areas (Cacioppo et al., 1993, 1994; Herring et al., 2011), which is a long latency for a typical P300 component. Previous studies have demonstrated that the LPP is implicated in motivated attentional processing, which reflects motivational and emotional arousal (Schupp et al., 2000; Wang et al., 2018). Moreover, LPP amplitude has been shown to be positively related to evaluation categorization and deliberative continued processing in the late stage to make a purchase decision (Chen et al., 2010; Wang et al., 2016; Ma et al., 2017). By integrating previous studies, in the present study, situations with reviewer photos which would enhance the perception of social presence (Xu, 2014; Karimi & Wang, 2017) were expected to induce higher motivational and emotional arousal, resulting in a larger LPP amplitude compared to situations without reviewer photos. In addition, real reviewer photos would also make participants feel more like communicating with a real social entity, which would be evaluated better and need more continued processing, leading to an increased LPP amplitude in contrast to no reviewer photos.

As was mentioned above, the present study aimed to explore the neural pathways of purchase decision-making when consumers are exposed to different situations with or without reviewer photos by using ERP technology. Based on previous studies, P2, N2 and LPP are expected to encode three successive processes of purchase decision-making. Specifically, in the early automatic perception phase, situations with reviewer photos are speculated to induce a higher P2

amplitude compared to those without reviewer photos due to more attention allocation to the real reviewer photo. Subsequently, in the cognitive monitoring phase, a more negative N2 amplitude is anticipated in situations with reviewer photos as the real reviewer photos, which may enhance perceived social presence, attract more sustained cognitive attention resources. Finally, in the evaluative appreciation phase, situations with reviewer photos are expected to evoke a greater LPP amplitude, which are indicative of heightened motivational and emotional arousal.

## MATERIALS AND METHODS

### Participants

Twenty-two female undergraduate and graduate students were recruited from Yanshan University to participate in this experiment as paid volunteers. Since in our previous survey, female subjects paid more attention to online reviews when shopping online, the influence of reviewer photo on female subjects was more universal, representative, and typical. All subjects were right-handed and native Chinese speakers with normal or corrected-to-normal vision, with no history of neurological disorders or mental diseases. Their age ranged from 22 to 26 years, with a mean age of 23.27 years ( $SD = 2.36$ ). Prior to the experiment, written informed consent was obtained from each participant. The data from two subjects were discarded due to excessive recoding artifacts, resulting in 20 valid subjects for the final data analysis. The current study was approved by the Internal Review Board of the Laboratory of Cognitive Neuroscience at Yanshan University.

### Stimuli

Before the experiment, according to the Chinese Online Shopping Market Research Report in 2015 by CNNIC, 20 products were picked out, including clothing, digital products, commodities, and so forth. Then, another 40 female candidates were asked to select 10 products from this set that they had the most desire to buy in the near future. Results indicated that clothing, shoes, watches, handbags, cellphones, laptops, cosmetics, shampoo, snacks, and films were the top 10 merchandises that participants had the greatest purchase intention for, and thus they were chosen to comprise the product stimuli in this experiment.

The reviewer photos were selected from a dataset consisting of 120 individual Chinese female facial images collected from the Internet, in order to reduce the influence of unrelated variables, such as gender differences between subjects and stimulus images. All the faces were unfamiliar to the subjects and included no movie actors, singers, or other celebrities. Then, a calibration group of 40 females rated the attractiveness of these candidate faces on a 5-point Likert scale (1 = *not attractive at all*, 5 = *extremely attractive*). The 40 selected faces representing the real reviewers were close in attractiveness ratings ( $M = 3.089$ ,  $SD = 0.162$ ). The females on the photographs were full-face and in neutral facial expressions. In addition, the default avatar in this experiment was a head contour in gray. During the whole experiment,

each real review photo was presented only once, while the default avatar was repeated 40 times.

Finally, 80 online reviews (eight reviews for each product) were collected from the Internet about the 10 experimental products. All the products and reviews were shown in the form of Chinese characters (black, Song font, size 20, less than 8 lengths). Specifically, each review consisted of a sentence with less than eight Chinese characters. All stimuli were grayscale, with the same contrast, brightness, and size ( $220 \times 200$  px) equalized using Photoshop 7.0 (Adobe Systems Incorporated, San Jose, California, USA).

The entire experiment consisted of 80 trials. Therein, each product was repeated eight times, while each real review photo and each online review were shown only once, and the default avatar was presented 40 times. The real reviewer photos and the default avatars were equally distributed over each product.

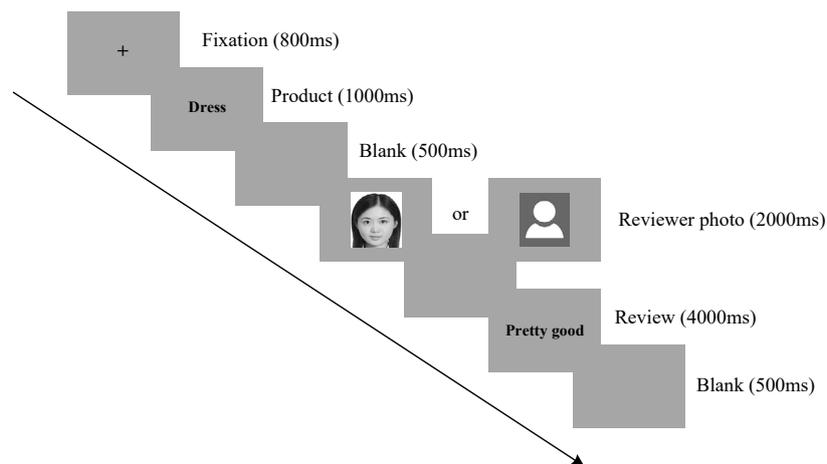
### Procedure

Participants were seated comfortably in a dim and sound-attenuated room, maintaining a distance of 80 cm from a 23 in. computer-controlled monitor ( $1024 \times 768$  px) on which the stimuli were presented centrally with a visual angle of  $2.87 \times 2.65$ . Before the formal experiment began, all the participants were given a written introduction about the experiment task and process. Then, they were informed that the reviews shown in the experiment were similar in positive valence but the reviewer photos were different, with reviewer photos showing a real human photo, while situations without reviewer photos showing a human profile contour. Subsequently, they were instructed to respond with their purchase intention corresponding to the reviewers' photos by using a keyboard. Specifically, half of the subjects were asked to press the *F* key for "*buy*" and *J* key for "*not buy*", while the others performed in an opposite pattern. Furthermore, participants were instructed to minimize eye blinking and muscle movement in the course of the experiment.

The procedure for each trial is shown in Figure 1. Each trial began with a fixation cross against a gray background, lasting for 800 ms to concentrate participants' attention. Subsequently, the name of the product appeared for 1 s, followed by a 500 ms blank screen. Afterwards, the reviewer's photo was presented for 2 s during which the EEG signal was locked. Then, a blank screen was flashed for 500 ms. After that, a review about the product was displayed until participants determined whether to buy or not and gave their key press reaction within 4 s. Meanwhile, RT was recorded from the moment of presentation of the review to the key press reaction. The key press reaction was counterbalanced among the subjects. The stimuli and recording triggers were presented using the E-prime 2.0 software package (Psychology Software Tools, Pittsburgh, PA, USA). The entire experiment consisted of 80 trials and started formally after an exercise of four trials.

### Electroencephalography Recording and Analysis

The EEG data was recorded with a cap containing 64 Ag/AgCl electrodes and a Brain actiCHamp amplifier (Brain Products GmbH,

**FIGURE 1.**

Experimental task. Participants were instructed to make a purchase decision toward reviewers with different profile photos (present vs. absent).

Munich, Germany) with a sample rate of 500 Hz. A cephalic (forehead) location was used as the ground, and Cz was served as the online reference. The EEG signals were rereferenced offline to the average of the left and right mastoid references. The horizontal and vertical electrooculograms (EOGs) were recorded from electrodes placed 10 mm from the lateral canthi of both eyes and above and below both eyes. Electrode impedances for each channel were maintained below 5 k $\Omega$ .

After acquisition, ERP components were analyzed offline by BrainVision Analyzer 2.1 (Brain Products GmbH, Munich, Germany). The EEG recordings were digitally filtered through a zero-phase shift with a low-pass filter at 30 Hz (24 dB/Octave). Trials containing peak-to-peak deflection exceeding  $\pm 100 \mu\text{V}$  were excluded. The EOG artifacts were corrected by the method proposed by Semlitsch et al. (1986). Then, EEG data was segmented into epochs from 200 ms before the onset of the reviewer's photo to 800 ms after presentation, with the first 200 ms pretarget interval as the baseline. Finally, the extracted epochs over each recording site for every participant were averaged separately for the two conditions (reviewer photo present vs. absent).

Based on the observations of grand average waves and previous studies mentioned in the Introduction section, the P2, N2 and LPP components were analyzed. Time windows of 140-190 ms, 250-350 ms, and 600-750 ms were extracted for analyses of the P2, N2, and LPP, respectively (Carretié et al., 2001; Delplanque et al., 2004; Folstein & Van Petten, 2008; Herring et al., 2011). Nine electrodes (F1, Fz, F2, FC1, FCz, FC2, C1, Cz, and C2) over the frontal-central area were included for the P2 and N2, and 12 electrodes (F1, Fz, F2, FC1, FCz, FC2, C1, Cz, C2, CP1, CPz, and CP2) over the frontal-central parietal were included for the LPP (Jin, Fan et al., 2017). Repeated-measured analyses of variance (ANOVAs) were conducted for these three ERP components. Simple effect tests were employed when interaction effects were significant and Greenhouse-Geisser corrections were applied to all analyses when necessary.

## RESULTS

### Behavioral Results

A pairwise *t*-test was conducted for purchase rate, as shown in Table 1, which identified a significant effect of reviewer photo,  $t(1, 19) = 4.861$ ,  $p < .001$ . As depicted in Figure 2, the purchase rate was much higher in the condition with reviewer photos ( $M = 0.820$ ,  $SD = 0.144$ ) than without reviewer photos ( $M = 0.468$ ,  $SD = 0.283$ ). This means that the condition with reviewer photo led to a higher purchase rate.

As for reaction time, a pairwise *t*-test was also conducted, as shown in Table 1, which yielded a significant effect of reviewer photo,  $t(1, 19) = -2.264$ ,  $p < .05$ . As depicted in Figure 2, RTs were much shorter in the situations with reviewer photos ( $M = 760.817$  ms,  $SD = 216.914$ ) than without reviewer photos ( $M = 810.089$  ms,  $SD = 249.782$ ). This indicates that participants generally made decision faster when a reviewer photo was present.

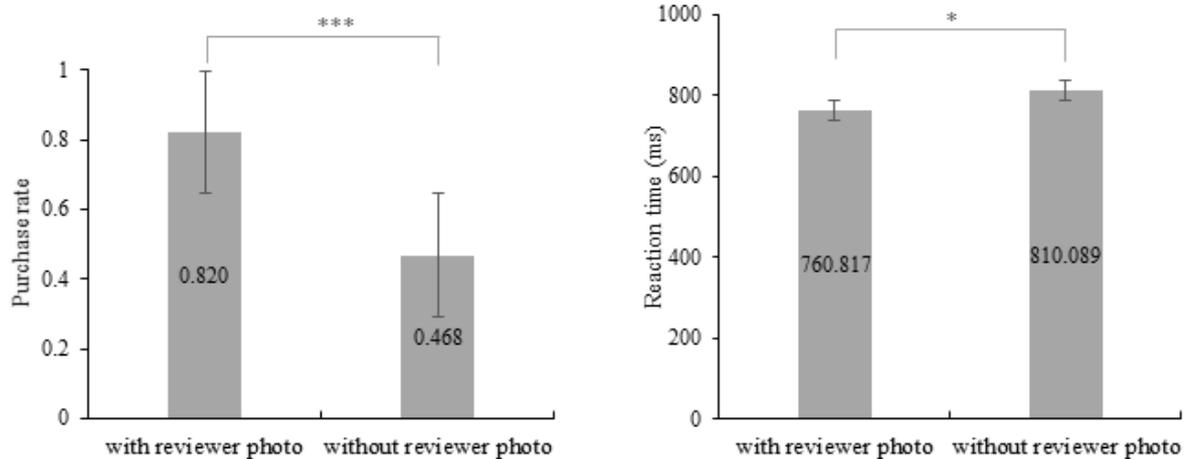
### Event-Related Potential Results

A two-way 2 (with reviewer photo vs. without reviewer photo)  $\times$  9 (electrodes) ANOVA was conducted for the P2 component in the time window from 140 ms to 190 ms. As shown in Table 2 and Figure 3, there was a significant main effect of reviewer photo,  $F(1, 19) = 26.295$ ,  $p < .001$ ,  $\eta_p^2 = .568$ . The condition with reviewer photos ( $M = 1.858 \mu\text{V}$ ,  $SD = 0.353$ ) elicited a larger P2 mean amplitude than without reviewer photos ( $M = 1.087 \mu\text{V}$ ,  $SD = 0.312$ ). However, there was no significant

**TABLE 1.**

*t* Test Results of For Each Condition

Behavioral results	Experimental conditions	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Purchase rate	With photo	0.820	0.144	4.861	.000
	Without photo	0.468	0.283		
Reaction time	With photo	760.817	216.914	-2.264	.037
	Without photo	810.089	249.782		

**FIGURE 2.**

Behavioral results. The purchase rate (left) and reaction time (right) for each condition. The error bars indicate the SEM. \*\*\*  $p < .001$ , \*  $p < .05$ .

main effect of electrodes,  $F(8, 152) = 2.468$ ,  $p > .05$ ,  $\eta_p^2 = .603$ , nor a significant interaction effect between reviewer photos and electrodes,  $F(8, 152) = 1.018$ ,  $p > .05$ ,  $\eta_p^2 = .385$ .

A two-way 2 (with reviewer photo vs. without reviewer photo)  $\times$  9 (electrodes) ANOVA was also conducted for the N2 component in the time window from 250 ms to 350 ms. As presented in Table 2 and Figure 3, a significant main effect of reviewer photo was revealed,  $F(1, 19) = 8.357$ ,  $p < .01$ ,  $\eta_p^2 = .295$ . The condition without review photos ( $M = -0.552 \mu\text{V}$ ,  $SD = 0.372$ ) elicited a less negative N2 mean amplitude than with review photo ( $M = -1.955 \mu\text{V}$ ,  $SD = 0.653$ ). Nevertheless, the main effect of electrodes,  $F(8, 152) = 2.054$ ,  $p > .05$ ,  $\eta_p^2 = .558$ , and the interaction between review photos and electrodes,  $F(8, 152) = 0.511$ ,  $p > .05$ ,  $\eta_p^2 = .239$  were not significant.

As for the LPP component, a two-way 2 (with reviewer photo vs. without reviewer photo)  $\times$  12 (electrodes) ANOVA was also conducted in the time window from 600 ms to 750 ms. As illustrated in Table 2 and Figure 3, a significant main effect of review photo was observed,  $F(1, 19) = 4.891$ ,  $p < .05$ ,  $\eta_p^2 = .196$ . The condition with reviewer photos ( $M = 0.962 \mu\text{V}$ ,  $SD = 0.313$ ) elicited a larger LPP mean amplitude than without reviewer photo ( $M = 0.021 \mu\text{V}$ ,  $SD = 0.423$ ). The effect of electrodes exhibited no significance,  $F(11, 209) = 0.454$ ,  $p > .05$ ,  $\eta_p^2 = .333$ , nor did the interaction between review photo and electrodes,  $F(11, 209) = 1.801$ ,  $p > .05$ ,  $\eta_p^2 = .665$ .

In addition, two-tailed Spearman correlation analyses between the neural activities (P2, N2, and LPP) elicited by reviewer photos and the

purchase rate (PR) were performed respectively in order to explore functional connections between neural activity and purchase behavior. The results only show significant positive relations between the LPP amplitude and PR on FCz in situations with reviewer photos ( $r = 0.469$ ,  $p = .032 < .05$ ), which was not the case for situations without reviewer photos nor the other selected electrodes, respectively.

## DISCUSSION

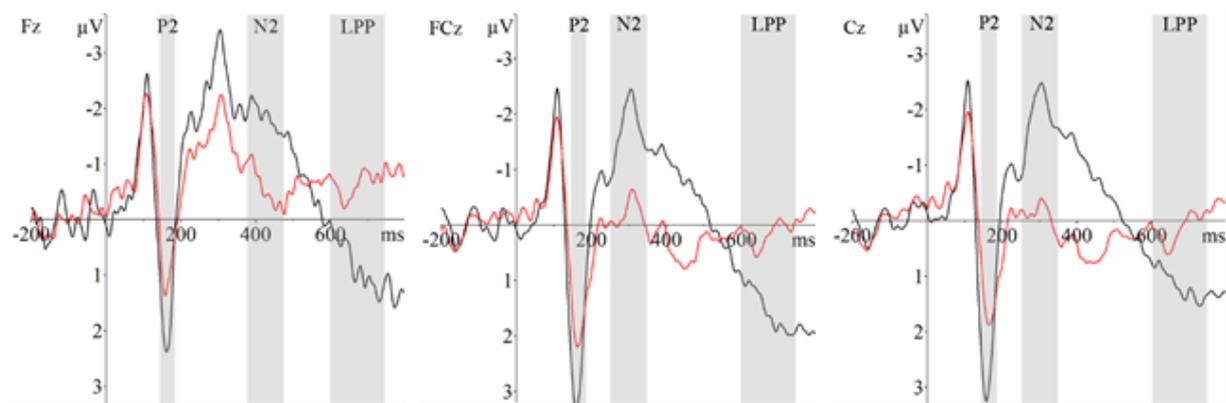
The present study explored how different types of reviewer photos affected consumer purchase decision-making on both behavioral and neural levels by applying ERPs. Specifically, participants browsed product information and reviewer photos that were framed either with real photo or placeholder photo and then made purchasing decisions for each product in a limited time. Additionally, the results of the experiment contributed to exploring why different types of reviewer photos had differential influence on purchase decisions.

Behaviorally, reviewer photos exerted a significant effect in both purchase rate and RT. Specifically, participants had a higher purchase rate with a shorter RT in situations with reviewer photos. In line with previous studies (Karimi & Wang, 2017; Xu, 2014), the results of purchase rate analysis supported the notion that the purchase rate in situations with reviewer photos was significantly higher. Namely, consumers prefer to see reviewer photos when shopping online. This is because real reviewer photos serve as social presence (Xu, 2014), closing the

**TABLE 2.**

ANOVA results of P2, N2 and LPP for each condition

ERP results	experimental conditions	$M(\mu\text{V})$	$SD$	$F$	$p$	$\eta_p^2$
P2	with reviewer photo	1.858	0.353	26.295	.000	.568
	without reviewer photo	1.087	0.312			
N2	with reviewer photo	-1.955	0.653	8.357	.009	.295
	without reviewer photo	-0.552	0.372			
LPP	with reviewer photo	0.962	0.313	4.891	.039	.196
	without reviewer photo	0.021	0.423			



**FIGURE 3.**

Event-related potential (ERP) results. Grand-averaged ERP waveforms of P2, N2 and LPP components from three representative electrodes (Fz, FCz, and Cz) in two conditions time-locked to the onset of the reviewer photo stimulus.

psychosocial distance between consumers and reviewers, and enhance trust in the reviewer and the online review (Karimi & Wang, 2017).

On the basis of the RT results, we deduced the decision difficulty and cognitive load under each condition. Previous studies have suggested that RT is positively associated with task difficulty and cognitive load (Sweller, 1988; Wang et al., 2016). Specifically, a longer RT generally implies a higher decision difficulty (Cheng et al., 2014; Jin, Zhang et al., 2017). In this current study, a shorter RT in situations with reviewer photos was found, indicating that consumers hesitated and needed to exert extra cognitive effort to make a final decision in conditions without reviewer photos due to higher decision difficulty, while consumers found it easier to make decisions with reviewer photos present. In other words, participants preferred to see reviewer photos when shopping online. Thus, they made purchase decisions more easily in these situations.

At the neural level, the situations with reviewer photos elicited larger P2, N2, and LPP amplitudes, which coded three successive neural processes for participants making purchase decisions, including an early automatic perception phase, a cognitive monitoring phase, and an evaluative appreciation phase.

With respect to the P2 component, previous studies have elucidated that the amplitude of P2 was an indicator of early rapid automatic activity, which was independent of conscious inferences (Correll et al., 2006; Yuan et al., 2007). Additionally, some findings have verified that more attention resources were mobilized to emotional than to neutral stimuli (Langeslag et al., 2007) and that the discrepancy between positive and neutral stimuli can be detected on the neural level (Herbert et al., 2006). Furthermore, the P2 over the front-central scalp areas is positively related to attention resources, which can indicate automatic mobilization of attention resources (Carretié et al., 2001; Huang & Luo, 2006). In the present study, a significant main effect of reviewer photo was identified on P2 amplitude, and P2 amplitude was significantly larger in situations with reviewer photos. These results show that more attention resources were engaged in processing real reviewer photos compared to processing placeholder reviewer photos. Specifically, we posit that when exposed to different types of reviewer photos, consum-

ers are independent of conscious inferences and automatically search for a certain attractive aspect of the information. The real reviewer photo was deemed to be a social presence and a signal for the allocation of cognitive resources, which led to a larger P2 amplitude and more attentional resources engaged in the real reviewer photo condition.

Regarding the N2 component, cognitive neuroscience studies have demonstrated that the N2 is implicated in attentional orienting to emotional stimuli (Cuthbert et al., 2000). From an evolutionary perspective, relevant information is prioritized for rapid and sustained attention (Van Hooff et al., 2010; Werheid et al., 2007). Furthermore, a greater N2 deviation has been confirmed to be an index of cognitive monitoring associated with increased attention (Folstein & Van Petten, 2008). In the present study, the N2 effect was observed, and a higher N2 amplitude was evoked in situations with reviewer photo, which may due to the biological significance of real reviewer photos indicating a real social entity (Chen et al., 2012). Specifically, in contrast to situations without reviewer photos, the real reviewer photos, which possess evolutionary importance, in essence raised the perception of social presence and enhanced the participants' cognitive attention, which was interpreted as the N2 effect in the current study and is consistent with prior studies.

As for the LPP component, extant studies have illustrated that the LPP reflects motivational significance (Hajcak et al., 2010), deliberative continued processing (Ma et al., 2017), evaluation categorization (Chen et al., 2010; Wang et al., 2016), and emotional arousal (Schupp et al., 2000; Ma et al., 2017). More specially, an increased LPP amplitude generally indicates stronger motivation (Bradley, 2009), positive evaluative categorization (Jin, Zhang et al., 2017), higher arousal effects (Ma et al., 2018), and an enhanced continued processing. In the present study, during the late cognitive processing stage preceding the purchase decision, the LPP effect on the type of reviewer photo was significant, and the LPP amplitude was significantly increased in situations with reviewer photos. The obtained results can be explained in the following two ways. First, in the current study, situations with reviewer photos seem to have been classified as a higher evaluative categorization compared with situations without reviewer photos, as the former

enhanced the perception of social presence due to its reality, leading to a higher emotional arousal, which triggered an increased LPP amplitude. Alternatively, in contrast to situations without reviewer photos, situations with reviewer photos had more evolutionary importance, which attracted more motivational and enhanced continued attention, thereby resulting in deliberative processing, which consequently evoked a greater LPP amplitude. Furthermore, the significant positive relation between the LPP amplitude and purchase rate also supports the above speculation. Due to the higher evaluation and stronger motivation, participants reported a higher purchase rate in situations with reviewer photos. However, the correlation between the LPP amplitude on the neural level and the purchase rate on the behavioral level was biased, in that the positive correlation between LPP amplitude and purchase rate was only significant on FCz, which was not the case for either of the other eleven electrodes.

Generally speaking, the present study recognized three ERP components evoked by the presence of reviewer photos, namely, P2, N2, and LPP, indicating three cognitive neural stages for participants when they see reviewer photos while making a final purchase decision. More precisely, during the decision-making process in this experimental paradigm, the P2 reflected an early automatic perception phase, the N2 reflected a cognitive monitoring phase, and the LPP reflected an evaluative appreciation phase. In other words, people usually automatically mobilized more attention resources to a certain attractive aspect of the information, and the situations with reviewer photos were more attractive, generating a larger P2 amplitude. People would then make cognitive judgments and monitor the reviewer photos to discern their evolutionary significance, and the more significant the reviewer photo, the greater the N2 amplitude. That is, situations with reviewer photos would enhance the evolutionary importance and elicit an increased N2 amplitude. Finally, people would deliberately process the information of the reviewer photo and have stronger motivation, feel higher emotional arousal, and obtain a better evaluative categorization for situations with reviewer photos, which led to more positive LPP amplitudes.

Based on the above results and discussion, the present study has some important practical implications for online sellers in terms of marketing. On the behavioral level, as situations with reviewer photos will lead to a higher purchase rate with a shorter RT, online sellers should encourage reviewers to present their real photos online to improve the persuasive function of online reviews. Furthermore, on the neural level, review photos will generate a larger P2 amplitude to automatically mobilize more attention, a greater N2 amplitude to facilitate more cognitive monitoring, and a higher LPP amplitude with emotional arousal to deliberately process. Therefore, online sellers should display reviewer photos on the foreground to rapidly draw attention from potential consumers, arouse their positive emotion, and increase consumption preference.

However, some limitations of the current study have to be acknowledged. First, it only investigated the reviewer photo effect for female consumers toward female reviewers, ignoring the reviewer photo effect for male consumers toward male reviewers and other opposite sex situ-

ations. Thus, future research is needed for these unexplored conditions and to perform comparative analyses. Second, the current study did not consider the product involvement, although it contained the top 10 types of products for online shopping marketing. As product involvement is an important factor in purchase decisions for consumers, future research should explore whether and how product involvement influences the reviewer photo effect.

## CONCLUSION

In summary, the current study explored how reviewer profile photos influenced online purchase decisions at the behavioral and neural levels by employing ERPs. It found that different reviewer photos were processed differentially and subsequently resulted in different purchase rates. The behavioral results indicated that participants had a higher purchase rate with a shorter RT in situations with reviewer photos compared to situations without reviewer photos. The ERP results revealed that situations with reviewer photos attracted more attention resources at the early automatic processing stage with a higher P2 amplitude, gave rise to greater cognitive monitoring at the middle cognition stage with a larger N2 amplitude, and resulted in a higher evaluation categorization at the late elaborate processing stage with a greater LPP amplitude. In general, consumers preferred situations with reviewer photos as the real reviewer photos possessed evolutionary significance and served as social presence to attract more attention, enhance more positive emotional arousal, and lead to a better evaluation categorization, resulting in a higher purchase rate.

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