How power and personality trait of others affect impression: Evidence from event-related potentials

Hongling Yang1, Xuebin Wang23, Aitao Lu23*, Meifang Zhang23 and Yaozhong Liu4

Abstract: It is well known that the personality traits and power associated with peoples’ impressions are represented in the memory system. However, there is scant evidence that these two types of personal information have an interaction effect on face impression, and in which processing stage it happens. The purpose of this study was to provide evidence for the temporal processing of personality traits and power in the retrieval of face impressions. We recorded event-related potentials when participants recognized faces. Compared to the low-power condition a clear positive-going ERP response for the high-power condition was found in the faces with positive traits, but the pattern reversed in the faces with negative traits in the time windows of 100–200 ms (N170), 250–350 ms (EPN), and 350–450 ms (N400). These findings illustrate for the first time the effect of personality traits in the encoding and recognition of personal faces could be moderated by power, directly suggesting negative traits for the powerless while positive traits for the powerful.

Subjects: Applied Social Psychology; Psychophysiology; Cognitive Neuropsychology; Behavioral Psychology

Keywords: Power; Personality trait; ERP; Impression

ABOUT THE AUTHOR
Hongling Yang is an associate professor in the School of Management, Guangdong Industry Polytechnic, China. Her main research interest is the influence of power in management.

Xuebin Wang is a master student in the School of Psychology, South China Normal University, China. His main research interest is cognitive psychology.

Aitao Lu is a Professor in the School of Psychology, South China Normal University, China. His main research interest is cognitive psychology.

Meifang Zhang is a master student in the School of Psychology, South China Normal University, China. Her main research interest is social psychology.

Yaozhong Liu is a Professor in the School of Management, Jinan University, China. His main research interest is human resource management.

PUBLILC INTEREST STATEMENT
The personal impression is a very subjective process, which could be affected by personal characteristics, such as personality traits and power. The findings in the current study distributed the insight that the power modulated the effect of personality traits on the impression of others, directly suggesting negative traits for the powerless while positive traits for the powerful. Perceived the important roles of personality trait and power toward impression, managers may apply this knowledge to self-management as well as establish authority, and further improve the efficiency of the organization.
1. Introduction

Personal impression is a very subjective and constructive process, which could be affected by factors such as characteristics of the people we observe, the environment we live in, our personality, and past experiences. For example, research has found that people usually form an overall impression of others based on their behavior and their similarity to others (Leshikar & Gutchess, 2015). Cassidy and Gutchess (2012) provided evidence that increasing social relevance could enhance older adults’ ability to successfully retrieve contextual information. Recently, Limbert et al. (2018) further found that personal information like age could affect memory for specific character information.

Power can be defined as asymmetric control over valuable resources (Magee & Smith, 2013), which is an important personal characteristic. Since power provides an opportunity to pursue personal goals and obtain resources for oneself (Keltner et al., 2010), power or sense of power has a wide and profound impact on the psychology and behavior of individuals. For example, it was found that high-power people tend to use automatic, goal-oriented cognitive processing and are more sensitive to rewards, while low-power people tend to use controlled processing and are more sensitive to punishment (Anderson et al., 2012). Additionally, high power increases the approaching behavior and risk taking tendency of individuals and makes them adopt rule-based moral judgment, while low power increases behavior inhibition and risk avoidance, leading individuals to adopt outcome-based moral judgments (Lammers & Stapel, 2009). Galinsky et al. (2008) also showed that high-power individuals were less susceptible to situational pressure and less willing to obey than low-power individuals.

It was found that one’s sense of power can affect his or her reaction to others (e.g., Dubois et al., 2015; Van Kleef et al., 2008). However, existing research has ignored a focus on how other’s power status affects this process. Specifically, the question of how the power of others could influence one’s impression of others remains open. To our knowledge, there is only one empirical study addressing the impact of power on personal face memory. Skagerberg and Wright (2008) asked participants to look at a series of faces and then put them in either a high-power or low-power situation. In the recognition test, participants in low-power situations were more likely to change their judgments to conform to those in high-power situations. They argued that power as the inaccurate post-event information could cause the participants to produce false memory.

Similar to most of the previous studies focusing on the effect of power (Wang & Sun, 2016), Skagerberg and Wright (2008) control power as an exogenous factor of the participants. That is, the participants were elicited to produce a high or low sense of power. Based on such manipulation, other research also found that high and low power elicited positive and negative emotions, respectively (Berdahl & Martorana, 2006). Thus, the effect of power on impression memory found in Skagerberg and Wright (2008) would be confounded by the different emotional states of participants with high power and low power, such emotional states directly affect impression memory.

Additionally, Skagerberg and Wright (2008) focused on the role of power in memory retrieval by manipulating the sense of power just before the participants entered the recognition test. Retrieval is the process of recalling stored information from memory. Successful retrieval can depend on one’s ability to re-access the events or information from the past, and the quality of memory about the events that are associated with the encoding process. Memory encoding converts the perceived information into a construct that can be stored and recalled later from the brain. The information comes from not only the endogenous input such as one’s emotional status, but also the exogenous inputs such as acoustic input, visual input, and semantic input (e.g., the power status of the others; Hadar et al., 2020). The current study expanded upon and further clarified the effect of power on memory by investigating how power as an exogenous factor affected the encoding and recognition of personal impression.
Personality traits are central constructs that describe and explain the behavior of people. Previous studies showed that facial images associated with positive or negative traits which were embedded in behavioral descriptions have a recognition advantage (Mattorozzi et al., 2019). Similarly, Kensinger (2009) found that emotionally evocative verbal items that reflected particular personality traits and were presented at the encoding stage could produce better subsequent memory performance than emotionally neutral items. It is widely believed that political leaders, senior military officials, successful corporate managers, and other power figures have typical personality traits (Kornør & Nordvik, 2004). Recently, Orghian et al. (2019) showed the close relationship between power and personality trait by demonstrating that when participants read the description of actors’ behavior, they could infer the positive and negative traits of the low-power actors, while for the high-power actors, they could only infer the positive traits but not the negative traits. However, it remains open whether the power and personality traits of others have an interaction effect on the encoding and retrieval of the impression about them.

People form impressions of others very quickly. For example, studies have found that people quickly and spontaneously infer the dominance of others. These inferences were made by looking at a person’s face in just 38 milliseconds (Willis & Todorov, 2006). Tiedens and Fragale (2003) found that people automatically used gestures to dominate or obey those they were interacting with. This complementarity suggests that the display of power (for example, the amount of space a person occupies) automatically activates social goals and triggers a power-based hierarchy (Tiedens & Fragale, 2003).

Several studies have shown that social emotional information regulates facial processing at an early stage. For example, the affective personal information was found to modulate the neural response for well-known faces between 200 and 300 ms and lasting to 500 ms (Wieser et al., 2014). Suess et al. (2015) showed that negative social information could affect the perception of both well-known and newly learn faces in the early time windows of 200–350 ms and 300–350 ms.

Due to the high temporal resolution, event-related potentials (ERP) help capture neural activity related to cognitive processes by precisely time-locking the activity. In the present study, we used ERP techniques and examined the dynamic retrieval of impression memory, focusing on whether power and personality traits as the exogenous input affect memory encoding and retrieval. In order to examine the dynamic process of personal impression, we took a look at the retrieval process of personal impression with power and personal trait as the characteristic of the target person. It is expected that such manipulation could help strengthen the direct causal effects of power and personality traits on impression memory. Based on previous studies, early components such as N170 and early posterior negativity (EPN) are two main components involved in face processing (Hammerschmidt et al., 2018). N400 has also been identified for face processing (Yovel & Paller, 2004). Thus, we investigated the influence of personality traits and power on face impression by focusing on N170, EPN, and N400. If power and personality traits do interactively affect the retrieval of the impression of others, it was predicted that significant interaction effects would be found in N170, EPN, and N400.

2. Method

2.1. Participants
Twenty-seven right-handed adults (age: 21.63 years, SD: 1.81 years, range 18–24 years, 11 males) participated in the experiment. All had the normal or corrected-to-normal vision and were naive concerning the purpose of the experiment. All participants gave informed consent in compliance with the Institutional Review Board of the South China Normal University (Guangzhou, China) before participation. None had any neurological disorder from a major head injury that was diagnosed as having a long-term side effect. The sample size of this study estimated by the
 statistical program G*Power 3.1 (G*Power, RRID: SCR_013726) with a setting of $\alpha = .05$ and power = .80 (Cunningham & McCrum-Gardner, 2007) was 24, which was less than 27.

2.2. Materials

A total of 120 neutral faces, 120 trait words, and two power-related words served as stimuli. Faces consisting of 60 female and 60 male neutral images were black-and-white photographs from the Chinese Affective Face Picture System (CAFPS; Gong et al., 2011). All pictures were resized to 300-pixel height (approximately 7.0 cm onscreen) and 260-pixel width (approximately 6.1 cm onscreen). The faces were divided into four groups of 30, each including 15 male and 15 female images. The four groups of face were balanced in emotional arousal based on a 9-point Likert scale (5.73, 5.73, 5.73, and 5.80; $F(3,116) = .89, p = .45, \eta_p^2 = .02$). Another new 60 neutral faces (30 male and 30 female images) from CAFPS were selected as the fillers in the recognition test.

The 120 trait words (60 positive words and 60 negative words) were adopted from the study of Leshikar et al. (2015). They were divided into four sets: two positive trait sets and two negative trait sets with each set including 30 traits. The first group of faces was paired with the high-power word “boss” and one positive trait set (High-Positive condition). The second group of faces were paired with the high-power word “boss” and one negative trait set (High-Negative condition). The third group of faces were paired with the low-power word “employee” and another positive trait set (Low-Positive condition). The fourth group of faces were paired with the low-power word “employee” and another negative trait set (Low-Negative condition). Faces were counterbalanced to appear with positive or negative traits, as well as with the high- or low-power word.

Twenty-eight participants (12 men) from the same subject pool as experimental subjects evaluated all trait words in the following 3 criteria: (a) familiarity: least familiar to most familiar (1–9 scale); (b) valence: positive or negative (1 for positive and 2 for negative); and (c) arousal: very low arousal to very high arousal (1–9 scale). The traits' mean familiarity (7.87, 7.78, 7.91, and 7.79) and mean (6.29, 6.22, 6.29, and 6.17) judgments did not show a statistical difference among four groups of trait sets (familiarity: $F(3,116) = 1.94, p = .13, \eta_p^2 = .05$; arousal: $F(3,116) = 1.54, p = .21, \eta_p^2 = .04$). There was significant difference in valence judgment with High-Positive and Low-Negative sets (1.01 and 1.01) being lower than High-Negative and Low-Negative sets, respectively (1.98 and 1.98; High-Positive vs. High-Negative: $F(1,58) = 27374.71, p < .001, \eta_p^2 = .99$; Low-Positive vs. Low-Negative: $F(1,58) = 36951.21, p < .001, \eta_p^2 = .99$). However, there was no significant difference between High-Positive and Low-Negative sets ($F(1,58) = 1.65, p = .20, \eta_p^2 = .03$), or between High-Negative and Low-Negative sets ($F(1,58) = .33, p = .57, \eta_p^2 = .01$).

2.3. Procedure

We adapted a direct paradigm used by Leshikar and Gutchess (2015). There were two phases in the experiment: the study phase (i.e., impression formation) and the recognition test phase. After practicing the study and the recognition test phases of the experiment, participants formed impressions for 120 trials over five study blocks, each containing 24 trials. On each study trial, a face, a power word, and a personal trait word were displayed for 9750 ms, followed by a 250 ms fixation (see, Figure 1(a)). Participants were instructed to form a High-Positive, High-Negative, Low-Positive, or Low-Negative impression of that person based on the face, power word, and personal trait. Participants pressed “7” (High-Positive), “8” (High-Negative), “9” (Low-Positive), or “0” (Low-Negative) to indicate the impression of each face with the four fingers of one hand (i.e., the index finger, middle finger, ring finger, and little finger), which were counterbalanced across participants.

The recognition test consisted of 180 trials (120 old and 60 new items), which were divided into five blocks. As shown in Figure 1(b), each trial started with a fixation for 250 ms, followed by a face. After 1000 ms, the phrase “old or new face” in Chinese appeared under the face. This signaled the
participants to judge whether the face was old (i.e., the studied face) or new with the index and middle fingers of one hand (i.e., face judgment task). If the participants made a correct “old” judgment (namely, the face was the one presented at the study stage), they were then tested on the memory for the trait and power identity of the face (i.e., power-trait judgment task) after a 250 ms blank with the face remaining visible. The participants judged whether the face was a High-Positive impression, a High-Negative impression, a Low-Positive impression, or a Low-Negative impression as correctly as possible with the four fingers of another hand (i.e., the index finger, middle finger, ring finger, and little finger), which were counterbalanced across participants. If the participants made a wrong response or a correct “new” response to the face, they proceed to the next trial with a 250 ms blank screen. The combination between task and hand was counterbalanced among participants.

2.4. EEG recording and analysis
EEGs were recorded from the scalp with a 64-channel Ag-AgCl electrode cap (10–20 system) with a 500 Hz sampling rate and a 0.05–100 Hz band-pass filter. The data were re-filtered offline with a 0.05–30 Hz band pass. All of the electrodes were referenced to the ground and re-referenced off-line to the mean of two mastoids. Vertical eye movements were monitored via supra- to sub-orbital bipolar montage. EEG and EOG data were amplified with a BrainAmp MR plus EEG amplifier. The impedance of the electrodes was maintained below 5 kΩ throughout the recording session. Eye movements were corrected using the ocular correction ICA transformation in Brain Vision Analyzer 2.0.4 (Brain Products GmbH, Munich, Germany). Epochs were from −200 to 1000 ms time-locked to picture onset at recognition phase, with the artifact rejection threshold set at ± 80 μV. The percentages of rejection were 6.42%, 6.91%, 7.90%, and 8.64% for High-Positive, High-Negative, Low-Positive, and Low-
Negative conditions, respectively. Average waveforms were calculated off-line and separated by High-Positive, High-Negative, Low-Positive, and Low-Negative conditions. According to previous studies (Baetens et al., 2011; He et al., 2012; Lu & Hou, 2020; Luo et al., 2016; Ran et al., 2014; Yovel & Paller, 2004), the electrode sites F3, Fz, F4, C3, Cz, C4, CP3, CPz, CP4, P3, Pz, P4, PO3, POz, and PO4 were chosen, and the time window of 100–200 ms (N170), 250–350 ms (EPN), and 350–450 ms (N400) after the onset of the face in recognition test were selected for analysis in the current study.

3. Results

Note the face judgment task and power-trait judgment task involved delayed responses which were not valid behavioral measures to demonstrate target effects. Therefore, only response accuracy was emphasized. The accuracies of face judgment task and power-trait judgment task are shown in Table 1. These data were submitted to a 2 (Power: High vs. Low) × 2 (Trait: Positive vs. Negative)
For face judgment task, there were no significant main effects of Power ($F(1,26) = 2.36, p = .14, \eta^2_p = .08$) and Trait ($F(1,26) = 3.68, p = .07, \eta^2_p = .12$), or no significant interaction between Power and Trait ($F(1,26) = .90, p = .35, \eta^2_p = .03$). For the power-trait judgment task, main effect of Trait was significant ($F(1,26) = 11.57, p = .002, \eta^2_p = .31$) with higher
accuracy in positive condition (59.70%) than in negative condition (49.90%). However, the main effect of Power did not reach the significance level ($F(1,26) = .94, p = .34, \eta^2_p = .04$), neither did the interaction between Power and Trait ($F(1,26) = 1.76, p = .20, \eta^2_p = .06$). Importantly, the mean accuracies were 82.40% in the face judgment task and 54.78% in the power-trait task, which were significantly higher than their corresponding chance level (50% for face judgment and 25% for power-trait judgment task), indicating that the participants focused on the two tasks.

Mean ERP amplitudes were then computed for each participant for the 100–200 ms, the 250–350 ms, and the 350–450 ms time window. Figure 2 shows the grand average ERP waveforms for the High-Positive, High-Negative, Low-Positive, and Low-Negative conditions in the above three time windows. Two-way repeated-measures ANOVA was conducted with the Power (high vs. low) and Trait (positive vs. negative) as within-subject factors.

**N170 (100–200 ms).** There were no significant main effects of Power ($F(1,26) = 1.25, p = .27, \eta^2_p = .05$) or Trait ($F(1,26) = .85, p = .37, \eta^2_p = .03$). Importantly, there was a reliable interaction effect of Power and Trait, $F(1,26) = 13.23, p = .001, \eta^2_p = .34$. The negative-trait condition was less positive-going (0.24 μV) than the positive-trait condition (1.07 μV) for faces with high power ($F(1,26) = 4.49, p = .04, \eta^2_p = .15$), while the negative-trait condition was more positive-going (1.02 μV) than positive-trait condition (−0.58 μV) for faces with low power ($F(1,26) = 6.19, p = .02, \eta^2_p = .19$).

**EPN (250–350 ms).** There were no significant main effects of Power ($F(1,26) = 1.06, p = .31, \eta^2_p = .04$) or Trait ($F(1,26) < .001, p = .99, \eta^2_p < .001$). Importantly, there was again a significant interaction effect of Power and Trait ($F(1,26) = 5.74, p = .024, \eta^2_p = .18$). The negative-trait condition was less positive-going (2.07 μV) than the positive-trait condition (3.09 μV) for faces with high power ($F(1,26) = 4.56, p = .04, \eta^2_p = .15$), while there was a trend that the negative-trait condition was more positive-going (3.55 μV) than high-power condition (2.54 μV) for faces with low power ($F(1,26) = 2.21, p = .15, \eta^2_p = .08$).

**N400 (350–450 ms).** There were no significant main effects of Power ($F(1,26) = .29, p = .60, \eta^2_p = .01$) or Trait ($F(1,26) = .26, p = .62, \eta^2_p = .01$). Importantly, there was again a significant interaction effect of Power and Trait ($F(1,26) = 10.96, p = .003, \eta^2_p = .30$). The negative-trait condition was less positive-going (3.91 μV) than the positive-trait condition (5.12 μV) for faces with high power ($F(1,26) = 5.81, p = .02, \eta^2_p = .18$), while the negative-trait condition was more positive-going (5.63 μV) than the positive-trait condition (3.89 μV) for faces with low power ($F(1,26) = 4.43, p = .04, \eta^2_p = .15$).

4. Discussion
The present study examined the effects of power and personality traits on the retrieval of others’ impressions. Due to the delayed response in the behavioral task, we primarily considered the findings in the ERP results. Specifically, the results showed that there was a significant interaction effect of power and personality traits in the retrieval of impression memory in the time windows of 100–200 ms (N170), 250–350 ms (EPN), and 350–450 ms (N400). That is, a clear positive-going ERP response for the face with positive traits compared to those with negative traits was found in the high-power condition, but the pattern reversed in the low-power condition. Such results exist in all the three time windows. The results suggest the strong contribution of power and personality traits to face impression. Specifically, the valence of personality traits interacts with power in how people represent others in memory as well as in the retrieval of the others’ impression. This is the first study to demonstrate the interaction effect of personality traits and power on face memory.
The current study showed that the effect of personality traits on face memory was found modulated by power. That is, faces paired with positive personality traits plus high power as well as those with negative personality traits plus low power were more positive-going, while faces with positive personality traits plus low power as well as those with negative personality traits plus high power were more negative-going. On one hand, the current results explained why some recent studies showed that faces associated with an emotional context (e.g., personal information and behavioral description) did not have a memory advantage relative to faces associated with irrelevant neutral information (Mattarozzi et al., 2015), which may be confounded by factors such as power.

On the other hand, these results are consistent with previous studies on face memory that personal information may produce a more complex memory representation of the face, which further facilitates face recognition (Neumann et al., 2013). Unlike objects that can be disassembled and still recognized, faces are stored in memory as complete images. If only part of the image is available, or if the image is inverted, face recognition becomes more difficult (Murphy et al., 2020). When face is memorized with personal information such as emotion, power, and personality traits, the brain needs to recognize not only the face itself, but also the personal context.

This extra information leads to an interaction between the observer and the person (the face) being observed, which adds a social element to the process. It was found that there was an existing bias toward people with different social statuses, namely positive for the powerful and negative for the powerless (Tiedens et al., 2000). In the current study, the faces with high power and positive personality trait as well as those with low power and negative personality trait match the stereotyped representation of the powerful person and powerless person in long-term memory. That explains our finding that High-Positive and Low-Negative conditions elicited more positive-going amplitude relative to High-Negative and Low-Positive conditions, respectively.

From the perspective of one’s sense of power, previous studies showed that the influence of sense of power was multifaceted. For example, some researchers found that power enhanced interpersonal sensitivity (Schmid Mast et al., 2009) and opinion pick (Hall et al., 2006), increased helping behavior (Cho & Fast, 2018), and be more generous to others (Tost et al., 2015). That is, power may make people more concerned about others and the public good. However, previous studies have also shown that high-power people exhibit more unethical behavior than low-power people (Dubois et al., 2015). Lammers et al. (2010) used recall tasks to induce a sense of power and found that high-power people lied more in dice games than low-power people. In repeated ultimatum tasks, Koning et al. (2011) also found that the more powerful proposer lied more frequently than the responder. Carney (2010) argued that power could reduce the pressure on individuals to lie. To our knowledge, the current study is the first to provide evidence that the power of others can significantly shape one’s impression. Thus, our study is a good supplement to the existing research about the effect of power on memory.

Power consists of two aspects: control of oneself (personal power) and control of others (social power). Personal power refers to the ability to do things according to one’s will and obtain the results one wants (Mayiwar & Lai, 2019), such as the power of money. Social power refers to one’s ability to influence others and change others’ behaviors (Mayiwar & Lai, 2019), such as the power of managers over employees. Galinsky et al. (2006) believed that individual power rather than social power reduced individual compliance with norms. People with high personal power are more independent from others (Mayiwar & Lai, 2019). In contrast, social power is associated with self-dependence (Chen, 2020), so people with high social power may be more responsible and concerned about the interests of others. Galinsky et al. (2003) speculated that two factors of power, namely responsibility
and self-interest, have different effects. Thus, different manipulation of power may explain the divergence in findings of the previous studies.

In the current study, we manipulated social power and found that high-social power people were impressed as having more positive personality traits while low-social power people were impressed as having more negative personality traits, which consistent with the finding of previous studies focusing on social power. Different from personal power, social power is an important source of respect and esteem (Chen, 2020). Brauer and Bourhis (2006) found that people have positive attitudes toward powerful actors. People tend to think that the world is fair and therefore those with social power deserve it and are better people, while those without social power do not deserve it and are seen as more negative (Brauer & Bourhis, 2006).

Additionally, while the prior research has demonstrated the effect of personal information (e.g., name or personality traits) on short-term and long-term face recognition (Matarazzo et al., 2019), the current findings further indicate that the retrieval advantage for faces associated with personality traits and power is accessed early (around 170 ms) when we recognized the face. This is in line with the previous studies demonstrating that face memory was affected by the valence of behavioral description in an early component N170 (Luo et al., 2016). Importantly, the present study expanded on Luo et al. (2016) by showing the modulation effect of power on personality traits. The N170 has been found to reflect structural encoding and high-level face information processing, which would suggest that it is mainly modulated by physical features (e.g., Ganis et al., 2012). Our results indicate that pure bottom-up (physical) accounts do not seem to explain N170 modulations, favoring accounts that propose a mixture of bottom-up and top-down processes to be indexed by the N170 (e.g., Galli et al., 2006; Righart & de Gelder, 2006).

The EPN is regarded to reflect enhanced sensory encoding as a result of increased visual attention (e.g., Rellecke et al., 2011), enabling the subsequent and elaborate evaluation on the visual stimuli (Schacht & Sommer, 2009). Schupp et al. (2004) found that compared to the neutral faces threatening faces were associated with a stronger EPN amplitude. Furthermore, there is evidence showing that the effect of emotion on the EPN can be modulated by face and gaze orientation (e.g., Bublatzky et al., 2017). For example, several studies reported that faces with direct gaze were preferred and received high attractiveness ratings, possibly because direct gaze could increase the saliency of self-relevance perceived by the observer (e.g., Kaisler & Leder, 2016). On one hand, these results showed that the contextual facial information can influence EPN, even for neutral faces. On the other hand, faces with direct gaze have clear benefits to guide early perceptual processing and psychophysiological responses in social situations, which makes it more sensitive to detect the functional neural activity elicited by power and traits. The present study using neutral faces with direct gaze both replicates and extends previous research by providing evidence of the interaction effect of power and trait on the early stage of impression.

N400 has been observed to be larger for incongruent than for congruent words or face identity (Caldara et al., 2004). Such N400 effects for incongruity detection of facial identity was claimed to strengthen the idea that the N400 for faces was tied to more general semantic attribution processes (e.g., Hernández-Gutiérrez et al., 2021; Wiese & Schweinberger, 2015). The current study showed a less pronounced N400 effect in High-Positive and Low-Negative conditions, suggesting a semantic congruity in integrating high power and positive trait as well as low power and negative trait when retrieving an impression. In other words, high power and positive trait are tightly linked, so are low power and negative trait. Our results on N400 extended the previous finding by demonstrating that the interactive effect of power and trait continued to the semantic processing stage of face impression.
It should be noted that an obvious limitation of this study is the research design. The manipulation of trait word type (positive vs. negative) and power status (high power vs. low power) could contribute to examining the interactive effect between trait and power. By taking a look at different level of power, we could be able to identify the evidence that the role of trait in personal impression varies across high and low power statuses. However, as the trait words may be closely related to power (e.g., “visionary” for an employer, “hospitalable” and “lazy” for an employee), future studies should control the power of trait words to rule out its possible effect.

To conclude, consistent with previous findings, the results of the present study indicate that personal information such as power and personality trait is involved in the early retrieval stage of face memory by showing that their activation occurs as early as around 150 ms. Moreover, this is the first study to demonstrate that in the encoding and retrieval of personal faces, the effect of personality trait is modulated by the social factors such as power, directly suggesting negative traits for the powerless while positive traits for the powerful.

Acknowledgements
This work was supported by the Guangzhou Philosophy and social Science Planning Project (No.2020GZGJ258), the Humanity and Social Science Youth Foundation of Ministry Education of China (No.17YJC630195), the National Natural Science Foundation of China (31970990 and 62007009), the Foundation for Outstanding Young Scholars in Guangzhou (No. 18QNXR11), and the 13th Five-year Research Plan Project of Guangdong Province in 2020 (Moral Education Special Sciences of Guangdong Province, No. 2020JKDY018).

Funding
This work was supported by the National Natural Science Foundation of China [31970990, 62007009]; National Social Science Foundation of China [14ZDB155]; Fund for Key Laboratory for Social Sciences of Guangdong Province [2015WYS009]; Humanity and Social Science Youth Foundation of Ministry Education of China [No.17YJC630195]; Foundation for Outstanding Young Scholars in Guangzhou [No.18QNXR11].

Author details
Hongling Yang1
E-mail: bunny8005@163.com
Xuebin Wang1
E-mail: wangxb@m.scnu.edu.cn
ORCID ID: http://orcid.org/0000-0001-7266-6977
Altao Lu2
E-mail: altlpsy@gmail.com
Meifang Zhang3
E-mail: 1340952769@qq.com
Yaozhong Liu4
E-mail: liuyaozhong518@163.com
1 School of Management, Guangdong Industry Polytechnic, Guangzhou, GD, China.
2 School of Psychology, South China Normal University, China.
3 Philosophy and Social Science Laboratory of Reading and Development in Children and Adolescents (South China Normal University), Ministry of Education, China.
4 School of Management, Jinan University, Guangzhou, GD, China.

Disclosure statement
No potential conflict of interest was reported by the author(s).

Data availability statement
Data are available from the link: https://doi.org/10.6084/m9.figshare.18092948.v1

Citation information
Cite this article as: How power and personality trait of others affect impression: Evidence from event-related potentials, Hongling Yang, Xuebin Wang, Altao Lu, Meifang Zhang & Yaozhong Liu, Cogent Psychology (2022), 9: 2029246.

References
Anderson, C., John, O. P., & Keltner, D. (2012). The personal sense of power. Journal of Personality, 80(2), 313–344. https://doi.org/10.1111/j.1467-6494.2011.00734.x
Baetens, K., der Cruyssen, L. V., Achtziger, A., Vandekerckhove, M., & Van Overwalle, F. (2011). N400 and LPP in spontaneous trait inferences. Brain Research, 1418(1418), 83–92. https://doi.org/10.1016/j.brainres.2011.08.067
Berdahl, J. L., & Martorana, P. (2006). Effects of power on emotion and expression during a controversial group discussion. European Journal of Social Psychology, 36 (4), 497–509. https://doi.org/10.1002/ejsp.354
Brauer, M., & Bourhis, R. Y. (2006). Social power. European Journal of Social Psychology, 36(4), 601–616. https://doi.org/10.1002/ejsp.355
Bublatzky, F., Pittig, A., Schupp, H. T., & Alpers, G. W. (2017). Face-to-face: Perceived personal relevance amplifies face processing. Social Cognitive and Affective Neuroscience, 12(5), 811–822. https://doi.org/10.1093/scan/nsw001
Caldara, R., Jermann, F., Arango, G. L., & Van der Linden, M. (2004). Is the N400 category-specific? A face and language processing study. Neuroreport, 15(17), 2589–2593. https://doi.org/10.1097/ 00001756-200412030-00006
Carney, D. (2010). Powerful people are better liars. Harvard Business Review, 88(5), 32–33 https://eur opepmc.org/article/med/20429250.
Cassidy, B. S., & Gutches, A. H. (2012). Social relevance enhances memory for impressions in older adults. Memory, 20(4), 332–345. https://doi.org/10.1080/ 09658211.2012.660956
Chen, S. (2020). Social power and the self. Current Opinion in Psychology, 33, 69–73. https://doi.org/10.1016/j.copsyc.2019.07.021

Cho, Y. R., & Fast, N. J. (2018). Locking status hinders prosocial behavior among the powerful. Social Behavior and Personality, 46(9), 1547–1560. https://doi.org/10.2224/sbsp.2018.46.9.3150

Cunningham, J. B., & McCrum-Gardner, E. (2007). Power, effect and sample size using GPower: Practical issues for researchers and members of research ethics committees. Evidence-Based Midwifery, 5(6), 132–137 https://link.gale.com/apps/doc/A172050741/HRC?u=anon-90037b65&id=doi0573000.

Dubois, D., Rucker, D. D., & Galinsky, A. D. (2015). Social class, power, and selfishness: When and why upper and lower class individuals behave unethically. Journal of Personality and Social Psychology, 108(3), 436–449. https://doi.org/10.1037/a0000008

Galinsky, A. D., Gruenfeld, D. H., & Magee, J. C. (2003). From power to action. Journal of Personality and Social Psychology, 85(3), 453–466. https://doi.org/10.1037/0022-3514.85.3.453

Galinsky, A. D., Magee, J. C., Gruenfeld, D. H., Whitson, J. A., & Liljengquist, K. A. (2008). Power reduces the press of the situation: Implications for creativity, conformity, and dissonance. Journal of Personality and Social Psychology, 95(6), 1450–1466. https://doi.org/10.1037/a0012633

Galinsky, A. D., Magee, J. C., Inesi, M. E., & Gruenfeld, D. H. (2006). Power and perspectives not taken. Psychological Science, 17(12), 1068–1074. https://doi.org/10.1111/j.1467-9280.2006.01824.x

Galli, G., Feura, M., & Viggiano, M. P. (2006). “Did you see him in the newspaper?” Electroencephalographic correlates of context and valence in face processing. Brain Research, 1119(1), 190–202. https://doi.org/10.1016/j.brainres.2006.08.076

Ganis, G., Smith, D., & Schendan, H. E. (2012). The N170, not the P1, indexes the earliest time for categorical perception of faces, regardless of interstimulus variance. NeuroImage, 62(3), 1563–1574. https://doi.org/10.1016/j.neuroimage.2012.05.043

Gong, X., Huang, Y. X., Wang, Y., & Luo, Y. J. (2011). Revision of the Chinese facial affective picture system. Chinese Mental Health Journal, 25(1), 40–46. https://doi.org/10.3969/j.issn.1000-6729.2011.01.011

Hadbar, B., Luria, R., & Liberman, N. (2020). Induced social power improves visual working memory. Personality & Social Psychology Bulletin, 46(2), 285–297. https://doi.org/10.1177/0146167219855045

Hall, J. A., Murphy, N. A., & Mast, M. S. (2006). Recall of nonverbal cues: Exploring a new definition of interpersonal sensitivity. Journal of Nonverbal Behavior, 30(4), 143–155. https://doi.org/10.1007/s10919-006-0013-3

Hammerschmidt, W., Kagan, I., Kulike, L., & Schacht, A. (2018). Implicit reward associations impact face processing: Time-resolved evidence from event-related brain potentials and pupil dilations. NeuroImage, 179, 557–569. https://doi.org/10.1016/j.neuroimage.2018.06.055

He, W., Chai, H., Chen, W., Zhang, J., Xu, Y., Zhu, J., & Wang, W. (2012). Facial emotion triggered cerebral potentials in treatment-resistant depression and borderline personality disorder patients of both genders. Progress in Neuro-psychopharmacology & Biological Psychiatry, 37(1), 121–127. https://doi.org/10.1016/j.pnpbp.2011.12.003

Hernández-Gutiérrez, D., Muñoz, F., Sánchez-García, J., Sommer, W., Abdel Rahman, R., Casado, P., Jiménez-Ortega, L., Espuny, J., Fondevila, S., & Martín-Loeches, M. (2021). Situating language in a minimal social context: How seeing a picture of the speaker’s face affects language comprehension. Social Cognitive and Affective Neuroscience, 16(5), S02–511. https://doi.org/10.1093 SCAN/snb009

Kaisler, R. E., & Leder, H. (2016). Trusting the looks of others: Gaze effects of faces in social settings. Perception, 45(8), 875–892. https://doi.org/10.1177/0301006616643768

Keltner, D., Gruenfeld, D., Galinsky, A., & Kraus, M. W. (2010). Paradoxes of power: Dynamics of the acquisition, experience, and social regulation of power. In A. Guineo & T. K. Vescio (Eds.), The social psychology of power (pp. 177–208). Guilford Press.

Kensinger, E. A. (2009). Remembering the details: Effects of emotion. Emotion Review, 1(2), 99–113. https://doi.org/10.1177/17540739083300432

Koning, L., Steinel, W., van Beest, I., & van Dijk, E. (2011). Power and deception in ultimatum bargaining. Organizational Behavior and Human Decision Processes, 115(1), 35–42. https://doi.org/10.1016/j.obhdp.2011.01.007

Kormar, H., & Nordvik, H. (2004). Personality traits in leadership behavior. Scandinavian Journal of Psychology, 45(1), 49–54. https://doi.org/10.1111/j.1467-9450.2004.00277.x

Lammers, J., Stapel, D. A., & Galinsky, A. D. (2010). Power increases hypocrisy: Moralizing in reasoning, immorality in behavior. Psychological Science, 21(5), 737–744. https://doi.org/10.1177/0956797610368810

Lammers, J., & Stapel, D. A. (2009). How power influences moral thinking. Journal of Personality and Social Psychology, 97(2), 279–289. https://doi.org/10.1037/a0015437

Leshikar, E. D., & Gutchess, A. H. (2015). Similarity to the self affects memory for impressions of others. Journal of Applied Research in Memory and Cognition, 4(1), 20–28. https://doi.org/10.1016/j.jarmac.2014.10.002

Limbert, M. J., Coleman, J. A., & Gutchess, A. (2018). Effects of aging on general and specific memory for impressions. Collabra: Psychology, 4(1), 17. https://doi.org/10.1525/collabra.109

Lu, G., & Hou, G. (2020). Effects of semantic congruence on sign identification: An ERP study. Human Factors, 62(5), 800–811. https://doi.org/10.1177/0018720819854880

Luo, Q. L., Wang, H. L., Dzhelyova, M., Huang, P., & Mo, L. (2016). Effect of affective personality information on face processing: Evidence from ERPs. Frontiers in Psychology, 7, 810. https://doi.org/10.3389/fpsyg.2016.00810

Magee, J. C., & Smith, P. K. (2013). The social distance theory of power. Personality and Social Psychology Review, 17(2), 158–186. https://doi.org/10.1177/1088868312472732

Mattarozzi, K., Colonello, V., Russo, P. M., & Todorov, A. (2019). Person information facilitates memory for face identity. Psychological Review, 83(8), 1817–1824. https://doi.org/10.1037/tnr0000261-018-1037-0

Mattarozzi, K., Todorov, A., & Cadispoli, M. (2015). Memory for faces: The effect of facial appearance and the context in which the face is encountered.
Processing is biased by affective person knowledge. Social Cognitive and Affective Neuroscience, 10(4), 531–536. https://doi.org/10.1039/c1s100038h

Tiedens, L. Z., Ellsworth, P. C., & Mesquita, B. (2000). Stereotypes about sentiments and status: Emotional expectations for high- and low-status group members. Personality & Social Psychology Bulletin, 26(5), 560–574. https://doi.org/10.1177/0146167200260004

Tiedens, L. Z., & Fragale, A. R. (2003). Power moves: Complementarity in dominant and submissive non-verbal behavior. Journal of Personality and Social Psychology, 84(3), 558–568. https://doi.org/10.1037//0022-3514.84.3.558

Tost, L. P., Wade-Benzoni, K. A., & Johnson, H. H. (2015). Noblesse oblige emerges (with time): Power enhances intergenerational beneficence. Organizational Behavior and Human Decision Processes, 128, 61–73. https://doi.org/10.1016/j.obhdp.2015.03.003

van Kleef, G. A., Oveis, C., van der Löwe, I., LuoKagan, A., Goetz, J., & Keltner, D. (2008). Power, distress, and compassion: Turning a blind eye to the suffering of others. Psychological Science, 19(12), 1315–1322. https://doi.org/10.1111/j.1467-9280.2008.02241.x

Wang, F., & Sun, X. (2016). Absolute power leads to absolute corruption? Impact of power on corruption depending on the concepts of power one holds. European Journal of Social Psychology, 46(1), 77–89. https://doi.org/10.1002/ejsp.2134

Wiese, H., & Schweinberger, S. R. (2015). Getting connected: Both associative and semantic links structure semantic memory for newly learned persons. Quarterly Journal of Experimental Psychology, 68(11), 2131–2148. https://doi.org/10.1080/17470218.2015.1008526

Wieser, M. J., Gerdes, A. B., Büngel, I., Schwarz, K. A., Mühlerberger, A., & Pauli, P. (2014). Not so harmless anymore: How context impacts the perception and electrocortical processing of neutral faces. NeuroImage, 92, 74–82. https://doi.org/10.1016/j.neuroimage.2014.01.022

Willis, J., & Todorov, A. (2006). First impressions: Making up your mind after a 100-ms exposure to a face. Psychological Science, 17(7), 592–598. https://doi.org/10.1111/j.1467-9280.2006.01750.x

Yovel, G., & Paller, K. A. (2006). The neural basis of the butcher-on-the-bus phenomenon: When a face seems familiar but is not remembered. NeuroImage, 21(2), 789–800. https://doi.org/10.1016/j.neuroimage.2003.09.034
## Appendix Personality trait words in Chinese and its English translation

The trait words paired with “Boss” (high power)

| Positive (Set 1) | English translation | Negative (Set 2) | Chinese | English translation |
|-----------------|----------------------|-----------------|----------|---------------------|
| 诚实的          | Honest               | 多疑的          | Suspicious |                      |
| 自律的          | Self disciplined     | 挑剔的          | Picky     |                      |
| 自省的          | Introspective        | 虚弱的          | Timid     |                      |
| 有尊严的        | Dignified            | 健忘的          | Forgetful |                      |
| 优雅的          | Elegant              | 拖延的          | Procrastinating |              |
| 无私的          | Selfless             | 残忍的          | Cruel     |                      |
| 有趣味的        | Funny                | 疑问的          | Greedy    |                      |
| 慈悲的          | Dignified            | 阳刚的          | Dull      |                      |
| 有远见的        | Visionary            | 自大的          | Arrogant  |                      |
| 深刻的          | Profound             | 骄纵的          | Indulgent |                      |
| 仁慈的          | Merciful             | 忧虑的          | Anxious   |                      |
| 坦诚的          | Frank                | 无礼的          | Impertinent |                  |
| 果断的          | Decisive             | 忘恩负义的      | Ungrateful |                      |
| 坚持不懈的      | Persistent           | 忧郁的          | Melancholy |                    |
| 守时的          | Punctual             | 吝啬的          | Stingy    |                      |
| 博学的          | Erudite              | 被动的          | Passive   |                      |
| 沉稳的          | Calm                 | 迷信的          | Superstitious |                |
| 负责任的        | Responsible          | 容易气馁的      | Discouraged |                 |
| 真挚的          | Sincere              | 浮躁的          | Impetuous |                      |
| 廉洁的          | Incorruptible        | 自我中心的      | Egocentric |                    |
| 平易近人的      | Approachable         | 自负的          | Conceited |                      |
| 干练的          | Capable              | 虚伪的          | Hypocritical |                 |
| 守纪律的        | Orderly              | 失败的          | Perfumctory |                 |
| 思想开明的      | Open-minded          | 咄咄逼人的      | Aggressive |                    |
| 爱干净的        | Clean                | 孤僻的          | Solitary   |                      |
| 聪明的          | Smart                | 敌意的          | Decadent  |                      |
| 慷慨的          | Generous             | 尖酸刻薄的      | Acrimonious |                  |
| 勤劳的          | Hardworking          | 反社会的        | Antisocial |                    |
| 冷静的          | Sober                | 阴险的          | Insidious  |                      |
| 活跃的          | Active               | 炽热的          | Rigid     |                      |
