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The implicit need for power predicts recognition memory for anger faces: An electrophysiological study

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ABSTRACT

Abundant evidence on the influence of implicit motives on memory has been provided by autobiographical narrative; motive-relevant stimuli are better remembered than motive-irrelevant stimuli. However, the temporal dynamics of the influence of implicit motives on memory processes has never been investigated. Therefore, we investigated the impact of implicit need for power (nPower) on the recognition memory for anger faces that has been portrayed as potent incentive for power-motivated perceivers. To assess the electrophysiological correlates of nPower and its relation to recognition memory, we recorded event-related potentials (ERPs) elicited in an old/new recognition task in response to anger and neutral faces. While there was no difference in recognition accuracy to neutral faces for both groups of participants, higher recognition accuracy was observed for the high-nPower than for the low-nPower participants for the anger faces. During encoding phase, high-nPower participants showed an early and a late positive amplitude enhancement for anger faces; moreover, they exhibited larger later components related to recognition memory for anger faces during retrieval phase. All in all, our results show that nPower modulates anger face processing throughout all stages from encoding to retrieval.

1. Introduction

The notion that personality variables such as motives, attitudes, and interests selectively influence human memory is common psychological lore. Modern theories of human information processing have rekindled research interest in the interaction of personality and memory. Many studies have been conducted on the relationship between motivation and memory, suggesting that implicit motives play an influential role in memory processes (Woike, Lavezzary, & Barsky, 2001).

Implicit motives are defined as the motivational dispositions that operate outside of one's conscious awareness and fundamentally distinct from self-attributed motives measured via self-report questionnaires (McClelland, Koestner, & Weinberger, 1989). Implicit motives reflect recurrent preferences for particular qualities of affective learning experience and thereby are associated with intrinsic incentives. Recently, abundant evidence on the influence of implicit motives on memory has been provided by autobiographical narrative, showing that motive-relevant stimuli are better remembered than motive-irrelevant stimuli.

Implicit motives exert well-documented effects on episodic memory. Earlier research by McAdams (e.g., McAdams, 1982) documented that individuals high in implicit motive remembered motive-related episodes from their lives more. For example, individuals with strong agentic motives (achievement and power) are more likely to recall experiences about achievement, dominance, self-mastery or losing face; whereas individuals with strong communal motives (affiliation and intimacy) are more likely to recall experiences pertaining to love, friendship or social rejection (McAdams, 1982; McAdams, Hoffman, Mansfield, & Day, 1996). Replicating and extending this line of research, Woike (2008) studied the effects of agentic and communal motives on memory for agentic and communal episodes. Participants high in agentic motives recalled more agentic episodes and participants high in communal motives recalled more communal episodes.

On the basis of these studies, it becomes clear that implicit is significant for memory. Although there is little disagreement on the existence of motive-congruent memory bias, its time course is poorly understood. Narratives of autobiographical experiences represent the final product

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of memory-related information processing, but they offer relatively little knowledge of the actual stage of information processing of this influence to take place. To answer these questions, we take nPower as an example to examine how individual differences in nPower influence the time course of anger face processing and recognition memory by using ERP recording, that is, a widely used electrophysiological technique particularly suitable for tracking the time course of face processing from categorization to recognition.

The nPower represents a capacity to derive pleasure from having a physical, mental, or emotional impact on other individuals or groups of individuals and to experience the impact of others as aversive (Winter, 1973). Power-motivated individuals seek to dominate others and avoid being dominated, resulting in their particular sensitivity to social cues that signal others' dominance (e.g., Fodor, Wick, & Conroy, 2012; Schultheiss et al., 2008). Recent research tested it based on a theoretical framework of social information processing that postulates facial expressions of emotions (FEEs) as salient cues for interpersonal motives like nPower (see Stanton, Hall, & Schultheiss, 2010).

According to Stanton et al. (2010), FEEs are important nonverbal means of communication in social interactions as they signal the sender's high or low dominance to the perceiver. However, the effect that a sender's FEE has on a perceiver should also depend on the perceiver's implicit motives (Stanton et al., 2010). Because high-nPower individuals want to secure their influence in social interactions, FEEs signaling high dominance like anger, should represent a potent motivational incentive for power-motivated individuals.

Consistent with this view, Schultheiss and Hale (2007) found that nPower modulated attentional orienting to high dominance anger faces in the dot-probe task. Schultheiss et al. (2008) observed that the brain response to anger faces increased with nPower in several cortical and subcortical regions. Consistent with these findings, in a recent ERP study, Wang, Liu, and Zheng (2011) observed that power-motivated participants showed enhanced *P*3/LPP amplitude in response to anger stimuli, suggesting an increased recruitment of attentional resources for processing facial dominance signals. In a more recent ERP study using an oddball task, Wang, Liu, and Yan (2014) further demonstrated that high-nPower individuals, compared to low-nPower individuals, were better able to identify anger faces, particularly if anger was displayed with low intensity (see also Donhauser, Rösch, & Schultheiss, 2015). These findings support the assumption that anger faces represent salient motivational incentives for individuals with a high power motive.

It is suggest that nPower has a profound influence on anger face processing. Therefore, a reasonable possibility is that high incentive value conveyed by anger faces influences face recognition memory by acting at encoding and at retrieval as such biases could influence the processing of anger faces and hence the power-motivated individuals' memory for them.

Recent brain imaging have shed light on the neural underpinnings of nPower in emotion processing (Schultheiss & Schiepe-Tiska, 2013; Schultheiss et al., 2008). However, the temporal dynamics of the influence of this important social motive on memory processes have never been investigated. To assess the electrophysiological correlates of nPower and its relation to recognition memory, we recorded ERPs in response to faces that, at encoding, were evaluated for their emotion (anger vs. neutral), and at retrieval were judged as old or new. This procedure enabled us to investigate which processing stages are sensitive to nPower and verify if nPower might modulate the ERPs components correlated with recognition memory.

We investigated the well-established ERP old/new effect because it is suitable for pinpointing the recognition memory stages where the nPower-dependent processing of anger faces might differ. This effect refers to the fact that items presented previously (old items) elicit more positive ERPs during a recognition test with respect to stimuli presented for the first time (new items) (Rugg & Curran, 2007). More specifically, several studies found a parietal old/new effect starting at approximately 400–700 ms that varied in a manner consistent with conscious, intentional episodic recollection (Curran, 2000). Moreover, recent research suggested that the parietal old/new effect was sensitive to the amount of information recollected from episodic memory (Vilberg, Moosavi, & Rugg, 2006). Other early components elicited by faces that shows repetition effects are the positive amplitudes starting about 150 ms and negative amplitudes (N250) with an onset time between 200 and 300 ms, normally found in repetition priming tasks (Duarte, Ranganath, Winward, Hayward, & Knight, 2004; Schweinberger, Huddy, & Burton, 2004).

We examined the nPower-dependent differences in the participants' recognition memory for anger faces. More specially, we investigated recognition memory for anger and neutral faces in high- and low-nPower participants, analyzing behavioral measures as well as ERPs. The central issue was the degree to which nPower differences contribute to the memory bias for anger faces and the extent to which nPower would modulate electrophysiological marker of memory.

Based on published reports reviewed above, we hypothesized that high-nPower individuals will exhibit better memory than low-nPower individuals for anger faces. With regard to ERPs, we predicted that nPower influence anger faces recognition memory by acting at encoding and at retrieval as such biases could influence the processing of the anger faces and hence the power-motivated individuals' memory for them.

2. Methods

2.1. Participants

Thirty-two college students selected from 110 students (61 females, mean age = 21.34-year, SD = 1.35) by nPower scores of PSE participated. There were 15 high-nPower (7 females) and 15 low-nPower (6 females) participants (mean age = 21.33-year, SD = 1.18) finally because 2 were excluded for excessive eye movement artifacts. The difference in the participant gender composition of the group did not reach the significance level ($\chi^2[1] = 0.53$, ns) nor did the inclusion of participant gender in the analyses significantly alter the results reported below. Therefore, participant gender will not be discussed further.

2.2. nPower measure and group selection

nPower was assessed with PSE which requires participants to write stories about six pictures (for details, see Schultheiss & Pang, 2007). They had 5 min to describe the picture after viewing each one for 30s, then stories were coded for motive imagery by two scorers using Winter's (1994) *Manual for Scoring Motive Imagery in Running Text* by which nPower was coded when story characters act forcefully, provide unsolicited help, concern about fame, try to control, convince, or impress others, or elicit strong and non-reciprocal emotions in others. Inter-rater reliability was 0.76 for the overall sample and 0.85 for the final; average power motive scores were calculated. 110 participants averagely wrote 914 (SD = 153) Chinese characters containing 4.37 (SD = 2.16) nPower scores. Story scores were significantly correlated with its length ($r = 0.35$, $p < 0.01$) which was adjusted for protocol length by multiplying them by 1000 and divided by the word count. Participants were identified from the highest and lowest quartiles of nPower scores with 16 selected from each group for the final sample. The resulting group of low- and high-nPower participants had an average nPower score of 1.71 (SD = 0.86) and 8.32 (SD = 0.90) respectively. The groups differed significantly in power scores, $t(30) = 21.35$, $p < 0.001$, $d = 7.80$.

2.3. Materials and task

Stimuli included 240 black-and-white photographs of faces taken from Chinese Facial Affective Picture System (CFAPS; Wang & Luo,