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P300 as an index of attention to self-relevant stimuli☆

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Abstract

Past work suggests that information related to the self receives 'preferential access' to the limited pool of attentional resources. However, these studies have been limited by their reliance on response–time measures, which require overt responding and represent the combined effects of multiple stages of information processing. One aim of the present study was to extend past work by obtaining a response-independent index of attention allocation sensitive to changes in discrete stages of information processing. An additional goal was to explore the potential time course of differential sensitivity to self-relevant cues. We assessed the P300, an ERP component that provides an index of attentional resources, evoked by autobiographical self-relevant stimuli (e.g., one's own name). As expected, P300 was augmented for self-relevant stimuli relative to control stimuli. In addition, analyses of P300 latency indicate that the effects of self-relevance are present during higher-order stages of cognitive processing related to selective attention. These results complement and extend previous work on the role of self-relevance in the selection of material for further processing.

Keywords: P300; Self-relevant material; Attentional resources

Introduction

In everyday interactions, we are faced with the difficult task of acting upon important social cues while simultaneously collecting new information from countless sources, all within the constraints of a limited processing capacity. Helpful in this endeavor is the ability to pre-attentively screen the environment and determine which incoming stimuli warrant further attentional resources. Social psychologists have long recognized that this process is not entirely governed by the properties of the stimulus field; rather, it is in large part shaped by individual concerns, values, and expectancies. For instance, Postman, Bruner, and McGinnies (1948) proposed that what one "selects from a near infinitude of potential percepts" for further processing is "a servant of one's interests, needs, and values" (p. 142). Likewise, Kelly (1955) argued that one's system of social constructs operates as a "scanning pattern" that "picks up blimps of meaning" from the environment (p. 145).

Consistent with this tradition, a number of investigators have examined the extent to which personal relevance impacts the selection of material for more in-depth processing. By and large, results from these studies indicate that even when stimuli are equated in terms of physical properties, information related to personal concerns and values is more likely to receive attentional resources. For instance, in a classic experiment, Postman et al. (1948) found that words related to participants' idiosyncratically-important values were recognized at briefer presentation times than other words. These results lead Postman and colleagues to suggest that value orientations act as a "selective sensitizer," lowering the threshold for perceptual selection.

Bargh (1982) drew a similar conclusion after investigating the effects of personal salience on responses to a dichotic listening task. In this study, participants' task was to shadow words presented in a specified ear while ignoring words presented to the other ear. Some of the presented words were related to participants' self-concepts, and the amount of attentional capacity taken by

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the shadowing task was assessed by the probe reaction time (RT) task. Bargh reasoned that if self-relevant material is processed in a relatively automatic fashion, participants should require fewer attentional resources during the shadowing task when self-relevant cues are presented to the attended ear, and more attentional resources when self-relevant cues are presented to the ignored ear. Analyses indicated that self-relevant words are both more efficiently processed and more likely to distract attention from a primary task, a conclusion supported by results from studies using the Stroop color-naming paradigm (Bargh & Pratto, 1986; Geller & Shaver, 1976). These results are also consistent with previous findings indicating that autobiographical information such as one's own name can capture attention even when uttered by an unattended speaker (Cherry, 1953) or in an unattended channel (Moray, 1959), a phenomenon known as the "cocktail party" effect.

These studies have contributed to our understanding of social information processing by highlighting the role of personal salience in the initial scanning of the environment. They demonstrate that when physical properties of the stimulus field are controlled, self-relevant information is likely to receive preferential access to the limited pool of attentional resources. However, due to their reliance on response-time measures, these studies are limited in some important ways. First, RT measures require that a participant can recognize that a psychological event has occurred and can translate that recognition into an overt behavioral response. This approach is limited whenever the momentary allocation of attentional resources occurs in a manner that is inaccessible to conscious awareness. Second, because overt responses reflect the combined effects of several stages of information processing, including response selection and execution, RT measures are not informative as to the time course of the cognitive responses that operate during the processing of self-relevant information. For instance, it is unclear whether processing differences related to heightened personal significance occur at an initial screening stage, or at some later stage associated with more controlled processing.

The goal of the present study was to expand on past work in this area in two main ways: (1) by obtaining a covert measure of attention that arises independently of response execution and (2) by expanding the focus to include investigation of the where—in the sequence of cognitive processing following stimulus presentation—the effects of self-relevance may emerge. As a result, we capitalized on existing psychophysiological tools that allow for examination of the stream of information processing as it occurs. We recorded event-related potentials (ERPs), time-locked segments of EEG activity that reflect discrete stages of information processing that need not be accessible to introspection. In particular, we measured the P300, an ERP component characterized by a large positive wave approximately 300 ms following stimulus presentation.

We chose this particular component because it arises when higher-order cognitive operations related to selective attention and resource allocation are engaged (Donchin & Coles, 1988). The amplitude of the P300 is proportional to the amount of attentional resources engaged in processing a given stimulus (Johnson, 1988) and it is not influenced by factors related to response selection or execution (Crites, Cacioppo, Gardner, & Berntson, 1995). P300 amplitude therefore served as our covert measure of attention that arises independently of behavioral responding. The P300 is traditionally assessed using an "oddball paradigm," in which the subject is presented with a sequence of events representing two categories that vary along a given dimension, with one category occurring less frequently. A larger P300 is elicited by the events representing the low-probability category (Donchin, 1981), even in the absence of instructions to categorize along a relevant dimension (Ito & Cacioppo, 2000).

In addition to low probability, stimulus properties that heighten the amplitude of the P300 are relevance to the subject's task (Farwell & Donchin, 1991; Squires, Donchin, Herning, & McCarthy, 1977) and qualitative deviance (Farwell & Donchin, 1991; Nasman & Rosenfeld, 1990). These factors are independent and additive (Johnson, 1988). In addition, a subfield of research has demonstrated that stimuli characterized by intrinsic psychological relevance can elicit larger P300s even in the absence of these qualities. For instance, Johnston, Miller, and Burleson (1986) demonstrated that when stimulus probability and task relevance are held constant, P300 varies with the "emotional value" of the stimulus to the perceiver: stimuli with either high negative or positive emotional value evoke larger P300 components than neutral material. Another strategy for manipulating intrinsic psychological relevance involves comparing subject groups who are likely to view certain stimuli as more emotionally or adaptively consequential. For instance, Johnston and Wang (1991) demonstrated that identical pictures elicited different P300 amplitudes in women at different phases of the menstrual cycle; pictures of babies and male models evoked larger P300s in women in the high-progesterone phase as compared to women in the low-progesterone phase.

Given these results, we propose that due to its intrinsic psychological significance, material related to the self will elicit a large P300 response even when it is irrelevant to the task at hand and not physically deviant from stimuli in which it is embedded. To test this hypothesis, we used the traditional oddball paradigm to expose participants to sequences of autobiographical information. In some sequences, we embedded self-relevant targets which were neither task relevant nor physically novel. We measured the P300 elicited by these self-relevant oddballs.

For purposes of comparison, we also recorded the P300 elicited by two other classes of stimuli: one that should evoke a markedly large response, and one that should evoke a minimal response. The choice of these other stimulus classes was based on past work investigating stimulus properties that influence the amplitude of the P300. One comparison target type was characterized by both task relevance and physical novelty and was therefore expected to elicit a markedly large P300. The other target type used for comparison was characterized by neither task relevance nor physical novelty and was therefore expected to elicit a minimal P300 response. The central difference between these "control" stimuli and the self-relevant stimuli was the absence of personal relevance to the individual subject.

As noted, an additional goal of this study was to explore the time course of differential sensitivity to self-relevant information. One strategy used in this investigation involved a comparison of the P300 amplitude to self-relevant and control targets. Because personal relevance to the individual subject distinguishes these two target types, a difference in the P300 amplitude to these stimuli would suggest that cognitive operations related to selective attention and resource allocation are sensitive to self-relevance (Donchin & Coles, 1988). This finding would be consistent with earlier behavioral work on the effects of self-relevance on attentional gating.

We also conducted an analysis of P300 latency (the time point at which the P300 reaches its peak) to more precisely examine the potential time course of differential sensitivity to self-relevant cues. Kutas, McCarthy, and Donchin (1977) first suggested that the P300 latency can be used to index the duration of specific subcomponent processes that underlie attentional resource allocation. Since then, research has demonstrated that the P300 latency is particularly sensitive to the duration of stimulus categorization (Donchin, 1979; McCarthy & Donchin, 1981; Magliero, Bashore, & Donchin, 1984). Manipulations that make it more difficult to categorize a stimulus along a specified dimension increase the P300 latency. For example, Kutas et al. (1977) found that latencies were longer when participants were asked decide whether a word was a synonym of the word "Prod," as compared to the more simple task of distinguishing between the words "Fred" and "Nancy." The synonym task likely increased P300 latency because classifying those stimuli first necessitated an analysis of semantic meaning. On the basis of these results, we predicted that latencies would be shortest to the physically novel target types. It was assumed that because a physical attribute distinguished these targets from the stimuli in which they were embedded, the additional semantic analysis would not be necessary. By contrast, it was predicted that such an analysis would be necessary before self-relevant cues could be distinguished from the stimuli in which they were embedded. Therefore, we predicted that latencies to these targets would be relatively long.

Method

Participants

Sixteen right-handed undergraduate students (11 female) with normal or normal-to-corrected vision participated in this study in exchange for course credit or $20. The data for three female subjects were not used because too few individual trials remained after manual removal of artifact (e.g., EMG). As a result, all analyses reported here were computed on data from 13 participants (8 female).

Procedure

Autobiographical data acquisition

We obtained the self-relevant targets via e-mail approximately two weeks prior to the testing session. We asked participants to provide their responses to a list of questions tapping categories of autobiographical information such as "hometown," "high school," and "middle name" (see Appendix for complete list of categories). Participants were told that they would be completing a study on the comprehension of words and phrases, and that the purpose of obtaining the information was to make the experimental task "more interesting" by incorporating information relevant to subjects' own lives.[1]

Physiological data acquisition

Upon arrival participants were escorted to a testing room and seated in a comfortable chair approximately 5 ft in front of a computer monitor. Participants were reminded that they would be completing a study on word comprehension, and that as part of the study they would be viewing words on the computer screen representing different categories of autobiographical information. They were further instructed that these categories would be organized into blocks of six stimuli. They were told that nearly all of the stimuli would appear in black, but that they would occasionally see stimuli appear in red, and their task was to indicate at the completion of each block whether any stimuli had appeared in red. Participants were instructed to use a button-box with buttons labeled "Y" and "N" to indicate yes or no. Finally, participants were reminded that

[1] Not all autobiographical categories were applicable to every subject. In these cases, we dropped all three presentations of the non-applicable categories. All participants were presented with at least 27 categories, resulting in the possibility of at least 27 trials for each ERP averaged waveform.

we had attempted to make the task "more interesting" by including some of participants' own autobiographical information. They were told that some of their own information may occasionally appear on the computer screen,[2] but that they should only pay special attention to the red stimuli in order to complete the task.

Participants viewed words or phrases appearing sequentially on a computer screen. The stimuli were presented in blocks of six non-repeating words or phrases each. Each block represented one category of personal information. Participants were informed of the category to be shown prior to the start of each block. For instance, participants might see the word "Hometown" appear on the screen, followed by the phrases "Grand Rapids," "Ann Arbor," "Long Beach," "Sandy Creek," "New Haven," and "North Attleboro." Each time a block was presented, one word or phrase served as the target stimulus and the remaining five served as non-targets. We assessed the P300 in response to this target stimulus.

Participants saw blocks representing each category three times. For instance, they saw three different blocks of first names, three different blocks of hometowns, and three different blocks of e-mail addresses. During one presentation of each category, the target word or phase appeared in red and was therefore both physically novel and task relevant. During another presentation of each category, the target shared all of the same physical qualities as the non-targets, but stood out because it was idiographically self-relevant. For instance, the participant's own hometown was embedded among other hometowns. During another presentation of each category, the stimulus designated as the target actually did not stand out in any way—it was not self-relevant, and it did not appear in red. A randomly-chosen word or phase was designated as the target for the purpose of comparison. In sum, one target type was both relevant to the task and physically novel; one target type was irrelevant to the task but was self relevant; and one target type was not physically novel, task relevant, or self relevant. We refer to these three target types as "red," "self-relevant," and "control," respectively. All targets randomly appeared in the third, fourth, or fifth position of each block.

[2] This procedure differs from other work on implicit categorization (Ito & Cacioppo, 2000) in that here, participants were made aware of the implicit task dimension at the beginning of the study. We gave participants this warning because it was thought that if subjects had no prior knowledge that any of their information may appear during the task, the surprise of seeing self-relevant material, particularly the first piece of information, would excessively augment the P300 response to this target type. We believe that because more unexpected events elicit larger P300s (Duncan-Johnson & Donchin, 1977), subjects' awareness that self-relevant material may at some point be presented actually works against the possibility of obtaining a large P300 response to this material.

EEG was recorded from nine sites (F3, Fz, F4, C3, Cz, C4, P3, Pz, and P4) using an electrode cap (Electro-Cap International, Eaton, OH). Electrooculogram (EOG) was recorded using tin electrodes placed on the outer canthi, left supraorbital and left suborbital positions. Cortical electrode impedances did not exceed 5 KΩ. Cortical physiology signals were amplified and filtered using a Biopac Systems EEG100B electroencephalogram amplifier. EEG was measured with the left ear (A1) as reference and was re-referenced off-line to the average ears (A1 + A2/2) (Miller, Lutzenberger, & Elbert, 1991). High- and low-pass analog filters were set at 0.01 and 35 Hz, respectively. Digital sampling occurred at 512 Hz. Eye blink and movement were digitally correcting according to Gratton, Coles, and Donchin (1983). Raw EEG data were manually scored to exclude trials with artifact. Trials were averaged individually by electrode site for each participant within each stimulus condition.

Stimuli

Stimuli were words and phrases representing 31 categories of autobiographical information. Subjects were exposed to three different iterations of each category, and the 93 total blocks were presented in a random order. At the beginning of each block, the category name appeared on the computer screen for 2000 ms. Stimuli were then presented for 1000 ms, and an interstimulus interval of 1200 ms was used. Nearly all stimuli (94.4%) appeared in black font.

All non-self-relevant stimuli were obtained prior to the start of the study through random list generators (for numerical categories) and published lists of names, towns, states, etc. In each block the target was equated with non-targets in terms of word length and word number. For the name categories (e.g., own first name, grandmother's first name), targets were also matched with non-targets for gender and popularity. (We matched for popularity using lists published by the Social Security Administration.) We also tailored all non-target stimuli in the blocks containing self-relevant targets to the individual subject. A careful attempt was made to ensure that these targets were unique only in that they were idiographically self-relevant. For instance, if the subject's home state was two words long, all non-target stimuli were also two words long. If the subject's first name was two syllables long and was a very popular name for children born in the 1980s, all non-target stimuli matched those criteria.

Results

On the basis of prior research, inspection of individual subject waveforms, and a principal components

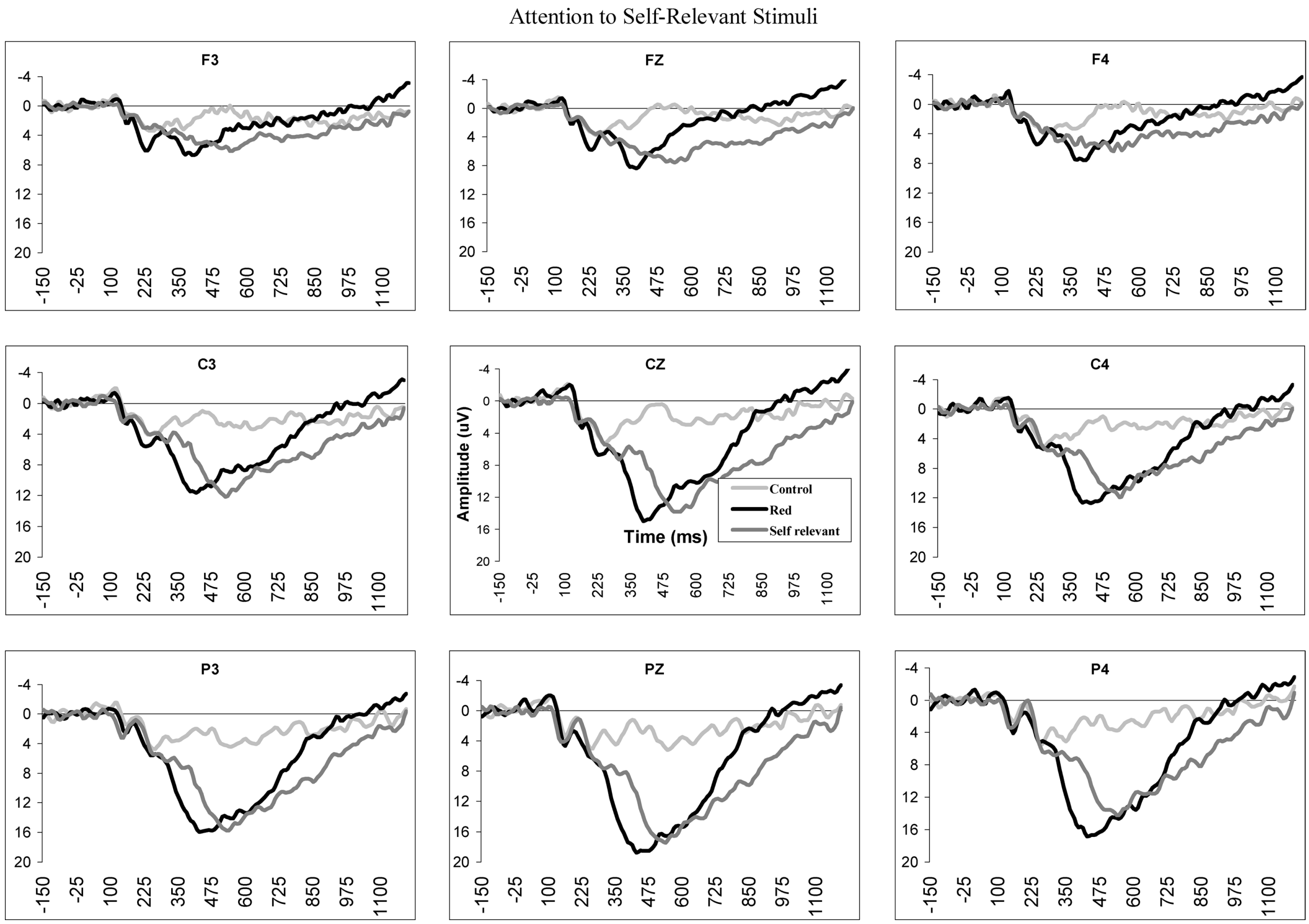

Fig. 1. Grand-average ERP waveforms for red, self-relevant, and control targets.

analysis (PCA), we choose to set the P300 window at 350–650 ms after stimulus onset. P300 was quantified within each average waveform as the largest positive deflection in that epoch. Both P300 amplitude and latency data were computed. Grand average ERPs to red, self-relevant, and control targets are presented in Fig. 1, and all values for amplitude and latency measures are presented in Table 1.

Inspection of individual subject waveforms also suggested the presence of a post-P300 slow wave (SW), a slow-shifting negativity believed to reflect "storage and retention of information in working memory" (Ruchkin, Johnson, Grafman, Canoune, & Ritter, 1992, p. 408).[3] The SW is often elicited in paradigms in which subjects are required to maintain information about a stimulus in working memory in order to make a subsequent decision about it, and increases in information load are reflected in more negative SW amplitudes (Ruchkin et al., 1992). It was hypothesized that of the three oddball types, red stimuli would present the greatest working memory demands because participants were required make note of them and keep them in mind until the completion of the block in order to make the correct response. As a result, we expected red targets to evoke a stronger (more negative) SW response than control or self-relevant targets. On the basis of individual subject waveforms and the PCA, we computed average SW amplitudes during the final 350 ms of the trial (850–1250 ms after stimulus presentation). Grand-average SW amplitudes are presented in Table 2.

P300 amplitude

We performed a 3 (Region: frontal, central, parietal) $\times$ 3 (Laterality: left, midline, right) $\times$ 3 (Target Type: red, self-relevant, control) ANOVA with repeated measures on all three factors. Main effects of Region and of Laterality emerged, $F(2,24) = 34.27$ and 14.10, $p < .001$. P300 showed normal topographical distribution: responses were greatest at parietal sites and at midline sites. The Region $\times$ Laterality interaction was also significant, $F(4,48) = 3.45$, $p < .05$. This interaction was decomposed through simple effects ANOVAs,

[3] We thank an anonymous reviewer for suggesting that we quantify this component.

Table 1
P300 Amplitudes and latencies

	Red targets		Self-relevant targets		Control targets	
	Amplitude	Latency	Amplitude	Latency	Amplitude	Latency
F3	9.03 (3.37)	401.44 (36.65)	7.88 (4.75)	513.37 (55.76)	4.79 (3.00)	472.20 (131.26)
Fz	10.77 (4.45)	405.05 (38.57)	9.97 (5.35)	515.92 (55.10)	4.37 (2.14)	475.51 (121.27)
F4	9.84 (4.28)	407.00 (48.04)	8.48 (4.05)	510.97 (52.69)	4.62 (2.21)	474.76 (123.70)
C3	13.83 (5.64)	436.30 (52.77)	13.85 (5.40)	531.40 (54.19)	5.62 (2.86)	490.54 (123.41)
Cz	17.15 (6.97)	431.79 (48.95)	16.41 (6.93)	532.30 (57.08)	5.74 (3.18)	489.63 (123.57)
C4	14.93 (5.41)	447.27 (54.73)	13.90 (5.58)	527.50 (43.34)	6.04 (2.78)	481.97 (119.05)
P3	18.57 (6.70)	447.71 (50.79)	17.41 (5.74)	519.38 (43.43)	6.93 (3.50)	482.72 (126.18)
Pz	21.89 (6.98)	457.78 (62.08)	19.68 (7.06)	525.54 (50.76)	7.54 (4.00)	475.78 (115.31)
P4	19.80 (6.62)	456.58 (56.44)	16.38 (6.01)	522.24 (47.59)	6.99 (3.81)	482.27 (117.37)

Note. Amplitude values are in microvolts (*SD*). Latencies are in milliseconds (*SD*).

Table 2
Slow wave amplitudes

	Red targets	Self-relevant targets	Control targets
F3	−0.32 (3.40)	2.49 (3.06)	1.64 (2.69)
Fz	−2.06 (3.95)	2.57 (3.48)	0.99 (3.31)
F4	−1.20 (3.95)	2 05 (2.69)	0.69 (2.88)
C3	−0.27 (4.71)	3.58 (3.46)	1.67 (3.04)
Cz	−1.45 (5.12)	3.79 (4.79)	0.79 (2.96)
C4	−0.34 (3.94)	3.12 (2.96)	0.96 (2.84)
P3	0.00 (5.14)	3.96 (3.98)	1.18 (2.55)
Pz	−0.68 (5.25)	4.22 (5.20)	0.96 (2.28)
P4	−0.37 (4.58)	3.31 (3.91)	0.51 (2.61)

Note. Amplitude values are in microvolts (*SD*).

which revealed that for all three regions, larger amplitudes were present at midline than lateral sites (all F's$(1, 12) > 8.50$, all p's $< .05$). However, this difference was greatest in the parietal region, at an intermediate level in the central region, and smallest in the frontal region.

A significant main effect of Target Type also emerged, $F(2, 24) = 46.56$, $p < .0001$. As expected, the P300 to red targets ($M = 15.09$ uV) was larger than the P300 to control targets ($M = 5.85$ uV), $F(1, 12) = 85.90$, $p < .0001$. The P300 to self-relevant targets ($M = 13.78$ uV) was also larger than the P300 to control targets, $F(1, 12) = 56.92$, $p < .0001$. The P300 to red and self-relevant targets did not differ, $F(1, 12) = 1.55$, *ns*.

A Region × Target Type interaction also emerged, $F(4, 48) = 22.89$, $p < .001$. Simple effects ANOVAs revealed that for all three regions, control targets evoked smaller P300s than both red targets (all F's$(1, 12) > 56.50$, all p's $< .001$) and self-relevant targets (all F's$(1, 12) > 21.30$, all p's $< .01$). These effects were largest in the parietal region, at an intermediate level in the central region, and smallest in the frontal region. In all three regions, P300s to red and self-relevant stimuli did not differ (all F's$(1, 12) < 2.50$, *ns*).

Finally, an interaction between Laterality and Target Type emerged, $F(4, 48) = 10.08$, $p < .001$. Simple effects ANOVAs revealed that at left, midline and right sites, control targets evoked smaller P300s than both red targets (all F's$(1, 12) > 19.90$, all p's $< .0001$) and self-relevant targets (all F's$(1, 12) > 52.00$, all p's $< .0001$). These effects were generally strongest in the parietal region and smallest in the frontal region. P300s to red and self-relevant stimuli did not differ at left, midline, or right sites (all F's$(1, 12) < 3.60$, *ns*).

P300 latency

The same $3 \times 3 \times 3$ repeated-measures ANOVA was performed on latency data. A main effect of Region was obtained, $F(2, 24) = 3.66$, $p < .05$. Latencies at frontal sites ($M = 464.03$ ms) were shorter than latencies at central sites ($M = 485.41$), $F(1, 12) = 5.02$, $p < .05$. Latencies at frontal sites were also marginally shorter than latencies at parietal sites ($M = 485.58$ ms), $F(1, 12) = 3.53$, $p < .09$.

A main effect of Target Type also emerged, $F(2, 24) = 5.07$, $p < .05$. Inspection of the means revealed that latencies were shortest to red targets ($M = 432.37$ ms), at an intermediate stage to control targets ($M = 480.62$ ms), and longest to self-relevant targets ($M = 522.07$ ms). The difference between P300 latency to red and self-relevant targets was significant, $F(1, 12) = 40.46$, $p < .0001$. The difference between P300 latencies to control and self-relevant targets was not significant, $F(1, 12) = 1.57$, *ns*, nor was the difference between P300 latencies to red and control targets, $F(1, 12) = 2.13$, *ns*.

Slow wave

Analysis of the slow wave component revealed a main effect of Target Type, $F(2, 24) = 8.81$, $p = .01$. The SW was more negative in response to red targets ($M = -0.75$ uV) than self-relevant targets ($M = 3.23$ uV), $F(1, 12) = 13.55$, $p < .01$. In addition, the SW to red targets was marginally more negative than the SW to control targets, ($M = 1.05$ uV), $F(1, 12) = 4.00$, $p < .07$. Finally, the SW to control targets was more negative than the SW to self-relevant targets, $F(1, 12) = 6.51$, $p < .05$.

Discussion

The purpose of this study was to complement previous work by investigating the role of self-relevance in information processing with the temporal precision afforded by event-related potentials. To that end, we compared the P300 component elicited by three types of targets: one characterized by low probability, task relevance and physical novelty; one that was characterized by low probability but otherwise held special significance only because it was self-relevant; and a third "control" target characterized by neither task relevance, nor physical novelty, nor personal significance. We assessed both the amplitude and latency of the P300s elicited by these target types in an attempt to answer two outstanding questions regarding the role of self-relevance in attention allocation.

First, P300 amplitudes were used to investigate the extent to which self-relevant material receives attentional resources when an overt behavioral response is not required. We first considered the amplitude of the P300 elicited by the red targets. Not surprisingly, this target type elicited a markedly large P300. These results are consistent with prior ERP research on categorization processes, which indicates that low-probability targets evoke a large late positive component that arises 400–600 ms after stimulus onset and is maximal in the centroparietal region. These results are also consistent with prior work demonstrating that physical deviance and task relevance are major antecedent variables that augment the P300, particularly when an action is to be performed on such stimuli (e.g., Nasman & Rosenfeld, 1990; Squires et al., 1977).

We next considered the amplitude of the P300 elicited by autobiographical self-relevant stimuli, such as one's own first name embedded among other first names. These stimuli also elicited a large P300. In fact, the amplitude of this component was nearly three times larger than the P300 to control targets and not significantly smaller from the P300 elicited by red targets. This result is remarkable given that participants were explicitly instructed to direct their attention only to red targets, and because self-relevant targets were equated with all non-target stimuli in terms of physical properties such as word length. These findings parallel the results of prior behavioral studies, which have generally indicated that self-relevance plays an important role in the selection of material for further processing (e.g., Bargh, 1982; Bargh & Pratto, 1986; Geller & Shaver, 1976).

Our preferred explanation for this finding is that self-relevant stimuli receives preferential access to attentional resources even when irrelevant to the task at hand because they are characterized by heightened psychological significance. We attribute this added significance in large part to the greater degree of emotionality associated with more familiar information, particularly that which is closely related to the self (Bargh, 1982; Zajonc, 1980). This explanation is consistent with the emotional value hypothesis of the P300 (Johnston et al., 1986), which states that stimuli high in emotional value elicit attentional resources even when irrelevant to a primary task. The emotional value hypothesis is supported by studies which have systematically manipulated the emotionality of presented material (Ito & Cacioppo, 2000; Johnston et al., 1986). The novel contribution of the present study, we propose, is that otherwise neutral material becomes affectively charged when it applies to the individual subject. As a result, this material takes on additional psychological significance and functions in a manner similar to stimuli specifically selected for its emotional intensity. An interesting avenue for future research would be to explore the P300 in response to autobiographical information that applies to a close other (e.g., a romantic partner). It is predicted that the response to such stimuli would vary as a function of familiarity and emotionality, such that more familiar and emotional material would elicit a larger P300.

An additional aim of this research was to investigate the time course of the cortical response to autobiographical self-relevant information, an issue that cannot be fully addressed in behavioral studies because overt responses represent the combined effects of several stages of information processing (including response selection and execution). Four findings of the present study are germane to this question. First, as noted, self-relevant targets elicited a larger response than control targets, which differed from self-relevant material only in their lack of personal applicability. As a result, it can be concluded that the effects of self-relevance are present at post-sensory (higher-order) stages of cortical responding, when capacity-limited controlled processes related to selective attention are engaged. Second, although no earlier components of the waveform were quantified, inspection of the grand means suggests that the difference between self-relevant and control targets did not begin to emerge until the beginning of the P300 component. Third, the analysis of P300 latency helps limit the range of information-processing stages that may be associated with the effects of self-relevance in this paradigm. As mentioned, P300 latency is believed to index the duration of stimulus categorization (e.g., Duncan-Johnson, 1981; McCarthy & Donchin, 1981; Kutas et al., 1977). We found a difference between the latencies evoked by red and self-relevant targets, with the P300 to self-relevant targets reaching its peak approximately 100 ms later. We suggest that red targets elicited a shorter P300 because they were physically novel and therefore more quickly classified as inconsistent than self-relevant targets, whose significance does not emerge until an additional semantic processing stage was complete. The lack of a latency difference between control and self-relevant targets suggests that the quality of self-relevance does not specifically impact the duration of stimulus classification in this paradigm. Finally, we further interrogated the time course of sensitivity to self-relevant material by examining differences in the post-P300 slow wave, a component known to index working memory demands. This analysis revealed a greater SW to red targets than to self-relevant or control targets, which is not surprising given that successful task performance required holding the knowledge of their presentation in mind until the completion of the block. Taken in tandem, these four findings suggest that relevance to the individual subject (as manipulated in the present paradigm) influences post-sensory processes related to attentional resource allocation, but does not impact specific subcomponent processes associated with stimulus categorization or working memory.

In conclusion, the present research provides electrophysiological evidence for the notion that self relevance impacts the manner in which information is processed. It appears that approximately 500 ms after stimulus presentation, available cognitive resources are directed toward information related to the self even when it is irrelevant to the task at hand. The use of event-related potentials allowed us to build on past work in two ways: by obtaining an index of attention that arose in the absence of overt behavioral responding, and by exploring the specific subcomponent processes associated with sensitivity to self-relevant material. This study adds to an emerging body of literature aimed at investigating social information processing with the temporal and spatial precision afforded by electrophysiological and neuroimaging tools.

Appendix. Autobiographical categories

Bank
Best friend's first name
Birth date
Birth town
Birth year
Car
Club membership
Father's first name
Doctor's name
E-mail address
Family nationality
Grandmother's first name
Grandfather's first name
High school
Home state
High school mascot
Home street
Hometown
High school colors
Hometown zip code
Hometown area code
Initials
Own last name
Own first name
Own middle name
Mother's first name
Pet's name
Phone number
Religion
Sibling's first name
Social Security Number (last four digits)

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