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Emotionally negative stimuli are resistant to repetition priming

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Abstract. The study was aimed at testing whether the repetition priming was influenced by affective valence of visual stimuli. Neutral and emotionally negative words and images were shown in the right or in the left visual field. Each of the stimuli was repeated twice, with 2 to 4 other stimuli presented between repetitions. The subjects' task was detection of a stimulus. Responses were given by index finger of the left or right hand. The task was the same for all stimuli, the new and the repeated ones. Reaction times were measured and analyzed. The effects of repetition priming were significant only for neutral stimuli: repeated items were detected faster than the new ones. For emotionally negative items, generally no priming was observed. Interestingly, new emotionally negative stimuli were detected significantly faster in comparison to neutral stimuli. The results are discussed in relation to attentional processes involved in processing of affective stimuli.

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INTRODUCTION

Viewing an item inevitably establishes some traces of that event, whether or not it can be later retrieved consciously or remains a hidden memory (Schacter et al. 1993). Prior processing of a stimulus often affects subsequent processing of the same stimulus. Priming may be viewed as a nonconscious facilitative influence of the past experience on current performance or behavior (Jaskowski and Przekoracka-Krawczyk 2005, Roediger and McDermott 1993, Schacter et al. 1993, Tulving and Schacter 1990). Priming is clearly distinguishable from other types of implicit memory (e.g., skill-learning) because it occurs after a single stimulus presentation (Hauptman and Karni 2002).

Priming is indexed by differences between a primed stimulus ("target") which has been preceded by a "prime" and an unprimed stimulus, which has not. In some cases, "prime" is just the initial presentation of the stimulus. That is the case of so-called "repetition priming": the primed (repeated) stimulus is identical to the prime (i.e., the same stimulus encountered for the first time) that, at the same time, plays a role of the unprimed stimulus. Thus, repetition priming can be estimated simply by comparing repeated versus initial presentations of a given stimulus. In some cases, the same task is performed on the primed stimulus as it was performed on the prime.

Examples of priming include decreased reaction times (RTs) to make the decision about the repeated – as compared to novel – stimulus, more accurate identification of primed stimuli, a bias to produce that stimulus when generating responses (Tulving and Schacter 1990). In functional imaging studies of priming, a reduced activation for primed versus unprimed stimuli was observed (Schacter and Buckner 1998, Wagner et al. 2000, Wiggs and Martin 1998). The reduced hemodynamic response is believed to reflect faster or more efficient processing of the primed stimulus. The decrease in activation can be seen in multiple brain regions, suggesting that several stages in the processing pathway can be facilitated.

One of the factors, influencing human memory, is the emotional nature of events or tested items. Memories for emotional stimuli have a persistence and vividness that other memories seem to lack (Christianson 1992). Memory is enhanced for emotional stimuli relative to neutral ones. This result has been obtained by using both emotionally arousing pictures (Bradley et al. 1992) and emotionally valenced words (Rubin and Friendly 1986). Specifically, the recall of emotionally negative items is enhanced relative to the recall of neutral items (e.g., Danion et al. 1995, Phelps et al. 1997). Several cognitive factors have been hypothesized to account for that effect, among them there are the enhanced attention for emotional stimuli, greater elaboration during encoding, greater distinctiveness, and, finally, increased rehearsal of emotional stimuli (Reisberg and Heuer 1992). Because priming may be viewed as perceptually based, implicit memory (Schacter and Buckner 1998), it might be also expected to be enhanced by emotion.

The behavioral findings of a recent fMRI study on repetition priming of neutral and fearful faces did not support the above view (Bentley et al. 2003). Interestingly, RTs for repeated fearful faces were not different from RTs for fearful faces presented for the first time. Thus, no effect of priming was observed at the behavioral level. At the neural level, imaging results in the lateral orbitofrontal cortex paralleled behavioral results, as the repetition decreases were attenuated for emotional faces relative to neutral ones, whereas in the inferior temporo-occipital cortex, the repetition decreases were similar for emotional and neutral faces.

We were interested whether the above RTs findings would be replicated for affective stimuli other than the fearful faces that constitute a very specific class of stimuli. We decided to test repetition priming for emotionally negative stimuli of two types: words and images. The use of those two types of stimuli enabled us to address the issue of familiar (e.g., words, known faces) versus unfamiliar (e.g., non-words, unfamiliar images) object priming. The latter continues to be the source of a debate within the literature between the "modification" and "acquisition" theories (Bowers 1996, Henson 2003, Tenpenny 1995). The modification theories state that priming reflects some modification of pre-existing representations (Bruce and Valentine 1985). According to the acquisition theories, exposure to any stimulus establishes some traces of its processing (Jacoby 1983, Schacter et al. 1990, 1993). The crucial difference between these two theories concerns the issue of priming for unfamiliar stimuli, without any pre-existing representations. Unfamiliar stimuli can be primed according to the acquisition theories, whereas they cannot according to the modification theories. Thus, by comparing in our study the effects of repetition priming for words (familiar stimuli) and images (unfamiliar stimuli) we expect to have an opportunity to get some arguments in favor of one of the two theories.

A further factor that may exert influence on the repetition priming is the hemispheric specialization for processing of affectively laden stimuli. The role of the right hemisphere of the brain in emotion processing seems to be well documented (Adolphs et al. 1996, Christman and Hackworth 1993, Levy et al. 1983). Many studies have suggested, however, that there is a hemispheric bias in the processing of emotional information depending on the valence of the emotion conveyed by that information (Davidson 1992), the negative valence being processed by the right hemisphere and positive by the left one.

Since our investigation of repetition priming for affective stimuli was limited to the negative emotions, findings of our study could enable us to relate to the issue of preferential involvement of the right hemisphere in processing of emotionally negative items (Borod et al. 2001). We restricted our stimuli only to neutral and emotionally negative because of general difficulty with finding suitable set of positive words. In case of Polish language, positive words are much longer than the average negative words so we decided to conduct our study only for neutral and negative stimuli.

Many behavioral studies in this field have used the divided visual field (DVF) technique. The logic of the DVF procedure depends upon the main feature of the visual system: the primary pathways from the left and right visual fields (LVF and RVF, respectively) are completely crossed and directly project to the right and left hemisphere, respectively. Stimuli briefly presented in one hemifield are therefore projected to the contralateral hemisphere and, subsequently, the visual information is transferred to the other hemisphere *via* interhemispheric commissures (Beaumont 1982). The DVF procedure was also used in the present study since it could provide information about the plausible lateralization of priming effects for affective stimuli. Thus we decided to introduce a task which is used in the Poffenberger paradigm, i.e., simple detection of stimuli.

Taking the above observations into account, there are reasons to expect that priming may differ for neutral vs. affectively laden negative items, words vs. images and the left vs. right hemifield of stimulus presentation. The aim of our work is to assess the foregoing hypothesis by investigating the effects of repetition priming for neutral and emotionally negative words and images addressed to the right or to the left hemisphere of the human brain.

METHODS

Twenty two right-handed subjects (9 men and 13 women) with no left-handers in the immediate families participated in the study. The experiment was undertaken with the understanding and written consent of the each subject. The study was approved by the Bioethics Committee of Warsaw University Medical School. All participants were screened to exclude those with current or past neurologic or psychiatric disorders. Handedness was assessed by means of the Edinburgh Inventory (Oldfield 1971). All participants were college or Ph.D. students (the mean age was 27.3) and had normal or corrected-to-normal vision.

The subjects' task was just the detection of stimuli, a task typical for the Poffenberger paradigm. Subjects were instructed to press on the button of the response pad (CEDRUS, model RB820 with wrist pad) as soon as they noticed that a stimulus had appeared on the monitor. They were asked to be as fast as possible. Simple reaction times (RTs) were recorded and analyzed. The response pad was placed in the midline, and the participants had to react unimanually with the index finger of the right or the left hand (RH and LH, respectively).

The software used for the presentation of visual stimuli and the measurement of subjects' reaction times was prepared based on the Inquisit software (Inquisit 1.33, Millisecond Software, Seattle, WA, USA). To avoid possible lateral attention effects, care had been taken to keep the visual field as symmetric as possible. Specifically, special attention was paid to ensure that monitor used to display visual stimuli had exactly the same RVF and LVF luminance since Ratinckx with collaborators have recently reported that the luminance of computer video-displays differs for the right and left side of a screen (Ratinckx et al. 2001). We decided to use the LCD monitor FlexScan L767 (EIZO, TFT Color LCD Panel) for which differences in the luminance between the left and right side did not exceed 1% as measured using Tektronix J17 LumaColor photometer (Tektronix®, Beaverten, Oregon, USA).

Two types of material were used in the study: images taken from International Affective Picture System – IAPS (http://www.phhp.ufl.edu/csea/IAPSinfo.pdf) and 4–6 letters Polish nouns. International Affective Picture System is well known and widely used in various types of experimental designs (Kuniecki et al. 2003, Pollatos et al. 2005).

Verbal and nonverbal stimuli were either neutral or emotionally negative. Overall, 64 neutral and 64 emotionally negative stimuli were used within experimentation as test stimuli, half of them were images and the other half, words.

The valence of neutral IAPS images (Lang et al. 2001) ranged from 4.69 to 7.52 (the average was 6.12, SD=0.94) and the arousal of neutral stimuli ranged from 1.76 to 4.63 (the average was 2.91, SD=1.02). The valence of emotionally negative images ranged from 1.31 to 3.78 (the average was 1.84, SD=0.98) and the arousal of emotionally negative stimuli ranged from 4.99 to 7.26 (the average was 6.37, SD=0.89). With respect to valence and arousal, images were evenly distributed between the two visual fields and the two responding hands. Additionally, special care was taken to equalize the luminance of: neutral and negative images, images displayed in the LVF and in the RVF, images presented in blocks with the RH and the LH responses. The average luminance of stimuli presented in each experimental condition was within the range 278–283 cd/m^2. The extreme values (i.e., minimal and maximal) in the luminance distribution of images were also very similar in each experimental condition.

Verbal stimuli were written in uppercase characters. Their lexical frequency ranged from 5 to 172 every 500 000 (for neutral words) and from 4 to 87 every 500 000 (for emotionally negative words) (Kurcz et al. 1990). There is – to our knowledge – no standardized set of emotional norms for the Polish words. As emotionally negative words, we chose nouns, depicted the IAPS images used as nonverbal test stimuli. The number of words that consisted of 4, 5, or 6 characters was the same for neutral and negative words. Moreover, words that consisted of 4, 5, and 6 characters were equally distributed between the two visual fields.

The experimental session was divided into 3 parts: training session, session with test stimuli, and session with control stimuli that consisted of meaningless and emotionless stimuli which physical features (e.g., size, luminance) were the same as the physical features of the emotionally negative and neutral stimuli. Two control stimuli were used: a color image constructed from small pieces of the IAPS images used in our study (it was of the same size and the same luminance as the size and the average luminance of IAPS images chosen as test stimuli) and a string of 5 black letters X. Each of the listed above sessions consisted of 4 blocks of trials, as there were two types of material (each presented in a separate session) and two responding hands (one hand used within a block). The total number of trials was 384. The experimental session started with 4 training blocks (16 trials each), followed by 4 blocks with test stimuli (64 trials each) and ended with 4 blocks with control stimuli (16 trials each). In each block, one type of stimuli (i.e., words or images, Xs or control image) was presented to the subjects. The order of blocks presentation and the responding hand was randomly chosen by the computer program.

Each trial started with the onset of a fixation mark and the onset of a sound (PCM 22.05 Hz, 16 bites, mono), lasting 140 ms and indicating that a stimulus would be presented soon. After a random foreperiod of 1 260, 1 360 or 1 460 ms, the stimulus was presented for 200 ms either to the left or to the right of the central fixation location. The participants were asked to press a button on the response pad as fast as possible. The hand with which participant reacted was counterbalanced, the hand with which he/she started was also counterbalanced. The order of experimental trials was pseudo-random with the constraint of no more than three consecutive trials: with the same visual hemifield of stimulus presentation, with the same type (neutral or negative) of stimulus or with the same mode of presentation (initial/repeated). The inter-trial interval varied from 2 s to 5 s.

Subjects were seated in a dimly illuminated and acoustically isolated chamber. The distance between the screen and the subjects' eyes was 70 cm. The size of each image was 3.5 × 2.7 deg. The size of verbal stimuli ranged from 2.8 × 0.8 to 3.4 × 0.8 deg. Each stimulus was centered at the position of 3.5 deg to the left or right of the central fixation point, which was a small red circle (radius: 0.2 deg). In half of trials, the stimulus was displayed in the RVF, in the other half – in the LVF. Each of the stimuli was repeated after 2–4 trials, in which other stimuli were displayed. The repeated stimulus was always displayed in the same visual field as the first encountered one.

Horizontal and vertical eye positions were recorded using the PANASONIC digital camera (model NV-MX 500 EG). Then, off-line, trials in which the subject did not fixate on the central fixation point were discarded and excluded from our statistical analyses.

RESULTS

Based on the literature, the 100–400 ms time range was selected as a time window for typical simple RTs

(Brebener and Welford 1980, Woodword and Schlosberg 1954). Thus, the RTs in single individual trials that were within that time frame were further analyzed and are reported below. Additionally, all analyses were repeated for the time window of 100–1 000 ms to check whether there was any impact of truncation on results of the RTs analysis (Ulirch and Miller 1994). Results of statistical analyses, particularly findings related to the repetition of stimuli, were similar for the 100–400 ms and 100–1 000 ms time frames. The percentage of excluded trials was as follows: 0.9% because of the horizontal eye movements during the unilateral stimulus presentation, 1.2% and 5.1% for the time frame 100–400 ms for RTs shorter than 100 ms and longer than 400 ms, respectively and 1.2% and 0.8% for the time frame 100–1 000 ms for RTs shorter than 100 ms and longer than 1 000 ms, respectively.

Test stimuli

Median RTs for all participants were analyzed using a repeated-measures MANOVA with gender (male, female), responding hand (LH, RH), visual field of stimulus presentation (LVF, RVF), type of stimulus (neutral, emotionally negative), material (images, words), and repetition (initial presentation, repeated presentation) as factors. Taking into account the aim of our study, the statistical significance of "repetition" factor and/or its interactions were the major points of interest.

Two main factors reached the level of statistical significance: "material" ($F_{1,20}$=38.271, P=0.0001) and "repetition" ($F_{1,20}$=8.524, P=0.008). Generally, RTs for the images were significantly shorter than for words (245 ms vs. 260 ms, respectively) and detection of the repeated stimuli was faster than detection of the stimuli presented for the first time (250 ms vs. 254 ms). Moreover, the "repetition" × "type of stimuli" interaction was statistically significant ($F_{1,20}$=9.512, P=0.006). All other factors and interactions were insignificant.

Highly significant interaction of "repetition" and "type of stimulus" may indicate that the effects of repetition priming were different for neutral and emotionally negative stimuli. Separate analyses for neutral and affective stimuli revealed that priming was significant for neutral stimuli ($F_{1,20}$=18.980, P=0.001) and it was insignificant for emotionally negative stimuli. In the case of neutral stimuli, RTs were shorter for the repeated stimuli in comparison to the same stimuli that were encountered for the first time. The RTs for initial and repeated presentations of neutral and emotionally negative stimuli are presented in Fig. 1.

On the other hand, the "repetition" × "type of stimuli" interaction may imply also the presence of some differences between RTs for neutral and emotionally negative stimuli either for the first or for the repeated presentations. It turned out that new negative stimuli were detected significantly faster in comparison to new neutral stimuli (252 ms vs. 257 ms, $F_{1,20}$=9.667, P=0.006). There was no such difference in the speed of detection of repeated stimuli.

In addition, although the effects of repetition priming we present both for neutral words and neutral images (Fig. 2), they were much stronger for words than for images ($F_{1,20}$=4.785, P=0.041) as indicated by

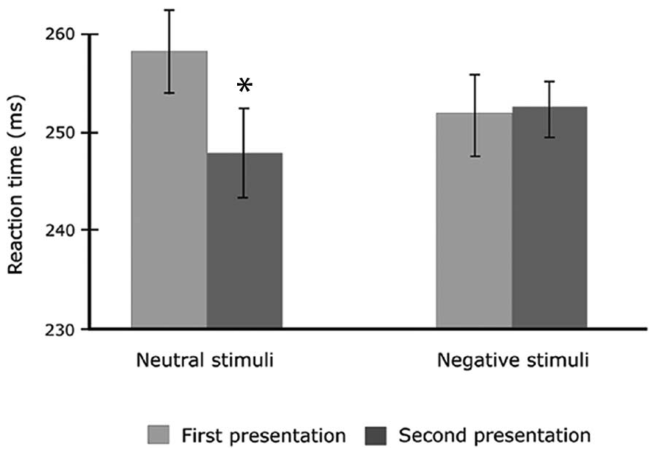

Fig. 1. Effects of repetition priming for neutral and emotionally negative stimuli. Bars represent SEM. *P<0.001.

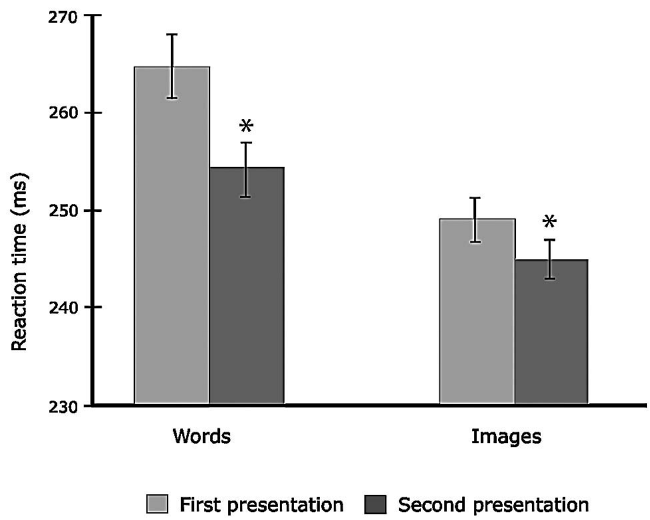

Fig. 2. Effects of repetition priming for neutral words and neutral images. Bars represent SEM. *P<0.05.

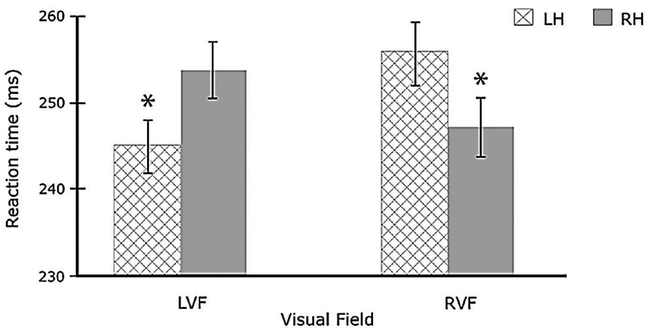

Fig. 3. RTs for control stimuli in crossed and uncrossed conditions. (LVF) left visual field, (RVF) right visual field, (LH) left hand, (RH) right hand. Bars represent SEM. *$P<0.001$.

the outcome of analyses performed separately for neutral and negative stimuli.

Control stimuli

Median RTs for all participants were analyzed using repeated measures analyses of variance with gender (male, female), responding hand (LH, RH), visual field of stimulus presentation (LVF, RVF) and material (color image, string of 5 Xs) as factors. "Material" was the only main factor that reached the level of statistical significance ($F_{1,20}$=6.948, P=0.016). In general, RTs in trials with image presentation were shorter than RTs in trials with a string of Xs presentation (247 ms vs. 256 ms), in line with the findings for control images and words.

Additionally, highly significant interaction "hand" × "visual field" ($F_{1,20}$=14.239, P=0.001) indicated that RTs in the uncrossed conditions (LVF/LH, RVF/RH) were shorter than RTs in the crossed conditions (LVF/RH, RVF/LH), a finding typical for studies employing the Poffenberger's paradigm (Marzi et al. 1991). Figure 3 illustrates the RTs for crossed and uncrossed conditions. Neither the two uncrossed conditions nor the two crossed conditions differed from each other ($F_{1,20}$=0.500, P=0.488 and $F_{1,20}$=0.147, P=0.705, respectively).

DISCUSSION

The main goal of the present study was to determine whether priming effects were influenced by the emotional valence of verbal and nonverbal stimuli addressed either to the left or to the right hemisphere. We have demonstrated that the effect of decreased RTs to detect a stimulus, following prior experience with the same stimulus, was influenced by the emotional valence of stimuli. In case of neutral stimuli, either the LVF or RVF presentations resulted in faster RTs for the repeated stimuli. In case of emotionally negative stimuli, generally no effect of priming was found. It should be stressed that even if emotionally negative stimuli were addressed to the right hemisphere that is specialized in processing of emotionally arousing material, no effect of repetition priming was observed. Effects of repetition priming were present for words and images, being stronger for words. In addition, RTs for new negative stimuli were shorter than RTs for new neutral stimuli. These results address research questions set out in the introduction and will be discussed subsequently. However, we would like to emphasise that our findings are only limited to negative stimuli since in that study we do not use positive stimuli. Thus, we can not rule out the possibility that usage of positive stimuli may lead to a change of the pattern of experimental findings.

The general lack of priming for emotionally negative stimuli found in our study may be viewed in the light of a specific attention bias. A growing body of evidence documents that attention is mainly directed towards emotional – especially negative – stimulation (Carretie et al. 2001, 2003, Fox et al. 2000, Hansen and Hansen 1988, Lang et al. 1997, Mogg and Bradley 1998, 1999, Prato and John 1991, Smith et al. 2003). Additionally, emotional stimuli capture attention with ease and are effectively processed even when attention is limited (Anderson and Phelps 2001, Keil and Ihssen 2004). Our finding that the detection of new, emotionally negative stimuli was significantly faster in comparison to the detection of new, neutral stimuli also support the view that attention is preferentially directed towards emotionally negative stimuli.

This speedy detection may be due to an elementary adaptive mechanism that guarantees fast reactions to the events/facts with a potentially high survival value (Ohman et al. 2001). On the other hand, those events/facts should be not missed even when repeated. Thus it may be hypothesized that the level of attention remained unchanged during initial and subsequent presentations of negative stimuli, resulting in similarly fast detection of those stimuli and – as a consequence – in the absence of priming effects. The above interpretation also seems to be in line with results of a recent study on the electrophysiological indices of habituation (Carretie et al. 2003). The latter study revealed that negative pictures were resistant to habituation because they had a greater capacity to attract and maintain the participants' attention even when such negative stimulation was familiar. Since even multiple repetitions did not lead to changes in the level of attention for emotionally negative stimuli (Carretie et al. 2003) one may expect that the repetition priming effects would also be attenuated for emotionally negative stimuli. Thus, the attentional processes may explain the lack of behavioral priming for negative stimuli, as revealed by the general RTs results obtained in the present study and the RTs findings reported by Bentley and his collaborators (Bentley et al. 2003) who have reported that emotional stimuli reduced behavioral priming: the RTs advantage normally observed with repetition of neutral faces was significantly diminished for repetition of fearful faces. In addition, general arousal evoked by any – positive or negative – emotional stimulus may participate in the reported effects. However, we are not able to test this assumption in details since we have used only stimuli with emotionally negative content.

Alternatively, the lack of repetition priming for negative stimuli may be interpreted in relation to memory processes. However, the negatively charged stimuli are not only accompanied by more correct recall and recognition than the neutral stimuli (Bradley et al. 1992, Ochsner 2000, Palomba et al. 1997) but also by higher probability of incorrect recall and/or recognition (e.g., Leiphart et al. 1993, Maratos et al. 2000, Windmann and Kruger 1998). The latter might be due to a response bias such that individuals are more likely to categorize/classify a negative item as "repeated", "old", or "previously seen", rather than an emotionally neutral item, whether the item is actually old or new. That response bias may occur even under conditions in which tested subjects are not explicitly instructed to attend to the emotional dimension of stimuli, or have any reason to expect that doing so would improve their performance. This response bias may reflect an automatic, elementary mechanism built-in to ensure that information with a potentially high survival value is not missed, even when the focus of attention is directed elsewhere (Windmann and Kruger 1998).

For those reasons, it might be speculated that no priming for negative stimuli reflected the fact that the new negative stimuli might be incidentally classified by the subjects as the old one and, this is why, generally, no changes in RTs were noticed between the initial and repeated presentations of emotionally negative stimuli. However, it should be stressed that subjects in the present study were supposed to ignore both the emotional and memory dimensions of stimuli. However, the emotional content of stimuli might be assessed independently of an evaluative intention (Hermans et al. 2001). Automatic stimulus evaluation is a very fast process and occurs at a very early stage of information processing (e.g. Ohman 1997, Pizzagalli et al. 1999). Similarly, subjects might incidentally or even intentionally recollect the previous presentation of a stimulus because any stimulus, when encountered, may automatically elicit a brief memory scanning, resulting in recollection of various pieces of information related to the stimulus, including its previous occurrence (Schacter et al. 1993).

Our findings could not definitely resolve the issue of validity of modification and acquisition theories. However, they seem to support rather the acquisition theories as reported priming effects were observed for both the stimuli familiar (words) and unfamiliar (images taken from IAPS) to our subjects prior to the experimentation. On the other hand, effects of repetition priming were stronger in case of words, in partial accordance with modification theories that, however, would predict the complete lack of priming for unfamiliar stimuli. Other studies that applied the procedure of repetition priming for familiar and unfamiliar stimuli revealed that effects of priming were similar for both classes of the stimuli whether they were words and Japanese ideograms Kanji (Nowicka and Szatkowska 2004) or familiar and unfamiliar faces (Schweinberger et al. 1995).

In the present study, shorter RTs were observed for pictures than for words in direct agreement with the results obtained by Schloerscheidt and Rugg (1997). Slower RTs for words may result from the fact that time-consuming reading is unavoidable while viewing words. For instance, in a visual search task, when subjects search lists for target words, they search faster through the non-word distractors than through the word distractors. However, the finding that RTs were slower for words than for images might be interpreted as a result of longer processing of stimuli composed of single, small elements (sequential processing) in comparison to processing of one object (global processing). That view is supported by the findings for our control stimuli: RTs for the string of Xs were longer than RTs for the meaningless and emotionless picture.

At the end of our discussion we would like to point to the issue of interhemispheric transmission that is not directly related to the main research questions of the present study. However, interpretation of any behavioral DVF result should relate to that issue since the visual information concerning laterally presented stimuli is always transferred to the other hemisphere *via* interhemispheric commissures. There are data indicating that the interhemispheric transfer may result in temporal delays (Nowicka and Fersten 2001, Nowicka et al. 1996, Saron and Davidson 1989) and/or some degradation of transferred information (Moscovitch 1986). A theoretical model proposed by Rizollatti and co-workers (Rizzolatti et al. 1971) states that behavioral differences between the LVF and RVF presentations of visual items may actually reflect the costs of interhemispheric transfer to the hemisphere more competent in processing of a stimulus if it was initially addressed to the less competent hemisphere. Discussion about the plausible impact of transcallosal conduction on the observed pattern of RTs patterns may start with the "hand" × "visual field" interaction that was found to be significant only for the control stimuli whereas it was insignificant for test stimuli. It means that for test stimuli, RTs in the uncrossed conditions were not shorter than RTs in the crossed conditions despite the fact that RTs might be expected to be shorter if a stimulus is addressed to the same hemisphere that initiated response. However, the latter is not always the case, since some studies have reported longer RTs if the responding hand was ipsilateral to the stimulated hemifield (Green 1984). Green has hypothesized that the slower reactions in the uncrossed condition were due to the interference between processing demands originating within the same hemisphere.

Interestingly, comparison of the averaged for the group median RTs for control and test stimuli revealed that RTs for the control stimuli were shorter than RTs for the test stimuli only for the uncrossed conditions (RVF/RH – 248 ms vs. 256 ms; LVF/LH – 245 ms vs. 251 ms). For the crossed conditions, RTs for the control stimuli were actually longer than RTs for the test stimuli (RVF/LH – 257 ms vs. 251 ms; LVF/RH – 256 ms vs. 253 ms). The questions, why for test stimuli, RTs in the uncrossed conditions were not shorter than RTs in the crossed conditions and why in the crossed conditions, reactions to the test stimuli were faster than to the control stimuli, are somehow related to each other and they could not be answered easily. It might be hypothesized, however, that in both cases it was due to the very efficient interhemispheric transmission of information regarding the test stimuli that were meaningful and in half of experimental trials affective, in comparison to the transmission of information regarding the control stimuli that were meaningless and emotionless.

CONCLUSION

In conclusion, we report the lack of repetition priming for negatively charged stimuli of two types: words and images. We do believe that only the converging evidence coming from different sources, i.e., from behavioral, clinical, electrophysiological, and neuroimaging research may provide adequate evidence supporting the notion about the absence/presence of priming for emotionally arousing stimuli.

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