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Hemispheric processing of global form, local form, and texture *

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Hemispheric processing of global form, local form, and texture of hierarchical patterns composed of many, relatively small elements and patterns composed of few, relatively large elements was examined in two experiments, employing a Stroop-type paradigm. In experiment 1 subjects were instructed to attend either to the global or the local level of the pattern and to identify the form at the designated level. In experiment 2 subjects were to identify the global form or the texture. A right visual field (left hemisphere) advantage was obtained for detection of local form, and a left visual field (right hemisphere) advantage was obtained for detection of global form. When many-element patterns were processed in terms of global form and texture, the results failed to show reliable hemispheric differences. The results suggest that the hemispheres differ in their sensitivity to the relatively more global versus the relatively more local aspects of visual patterns which require focused attention (as in global/local form detection). When the task involved distributed attention (as in texture detection) no lateralized effects were observed.

Two major dichotomies have been proposed for hemispheric specialization. One is the verbal/visuospatial dichotomy which implies that the two hemispheres specialize in different types of material. The other is the analytic/holistic dichotomy. It suggests that the right hemisphere is more specialized in holistic, global, Gestalt-like mode of processing, while the left hemisphere is more specialized in analytic mode of processing. (See Bradshaw and Nettelson (1981) for a comprehensive review, as well as for the claim that this hemispheric dissociation is a matter of degree.) Recently, functional differences between the two

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hemispheres have been investigated using the global/local paradigm (e.g., Martin 1979b; Sergent 1982; Boles 1984; Robertson et al. 1988).

Global and local processing

The perceptual relations between global and local aspects of visual patterns have been tested using hierarchical patterns in which local elements are aligned to form a global configuration (usually large letters composed of small letters), and examining relative speed of processing and interference effects when attention is directed to one level or another (e.g., Navon 1977, 1981; Pomerantz 1983; Kinchla and Wolfe 1979). Using a set of converging operations, Navon (1977) demonstrated the perceptual priority of the global configuration. Other researchers demonstrated important boundary conditions for the phenomenon, and pointed out some variables that can affect global versus local superiority. Such variables included stimulus size (e.g., Kinchla and Wolfe 1979), sparsity (Martin 1979a), 'clarity' or 'goodness' (e.g., Hoffman 1980), retinal location (e.g., Grice et al. 1983; Kimchi 1988; Pomerantz 1983), and location uncertainty (e.g., Lamb and Robertson 1988). Kimchi (1982, 1988, 1990; Kimchi and Palmer, 1982, 1985; see also Klein and Barresi 1985) demonstrated that the perceptual relations between the global and the local levels of hierarchical patterns depend critically on the number and the relative size of the local elements. When few large elements comprise a pattern, the local elements are perceived as figural parts of the overall form, and the two levels are perceptually integral. Patterns composed of many small elements are perceived as form associated with texture, and the two are perceptually separable. In addition, interference between the global and the local levels of many-element patterns seems to depend on task demands: the requirement to identify the global and the local forms resulted in interference between the levels.

Hemispheric differences in global and local processing

Several investigators used Navon-type stimuli with unilateral presentations to normal subjects, or with lateralized brain damaged patients, in order to examine hemispheric differences in detection of global and local aspects of the stimulus. Martin (1979b) employed a Stroop-like task and found that processing of the local letters was superior in the left hemisphere, whereas processing of the global letter did not appear to be strongly lateralized. Sergent (1982) employed a visual search task, and found a right hemisphere superiority whenever a decision had to be made on a large (global) letter alone, and left hemisphere superiority when a small (local) letter had to be processed. Sergent interprets her results as supporting the hypothesis that the hemispheres differ in their sensitivity to the spatial frequency characteristics of the sensory output available for cognitive processes: the right hemisphere is more efficient than the left hemisphere at processing early-available low frequency information, while the left hemisphere is more efficient at processing later-available high spatial frequency content. Sergent (1982, 1987) takes this hemispheric difference to be more fundamental than either the verbal/visuospatial or the analytic/holistic dichotomy. Robertson et al. (1988) presented Navon-type stimuli to brain injured patients and found that right hemisphere lesions affected global response times more than local response times relative to controls, while left hemisphere lesions affected local response times more than global response times relative to controls. Contrary to these findings there have been reports of null effects: Alivisatos and Wilding (1982), employing a matching task, and Boles (1984) and Lamb and Robertson (1988), employing a Stroop-like task, failed to show such lateralized effects with hierarchical patterns. Thus, the empirical data concerning hemispheric processing of global and local aspects of hierarchical patterns are not yet conclusive.

The inconsistency in the laterality findings may be due in part to specific letter properties (all of these studies used compound letters), and to aspects of stimulus structure. Although most of the stimuli used can be considered many-element patterns, no special care has been taken regarding the number and the relative size of the local elements, which has been proven to be critical for the perceptual relations between the two levels of hierarchical patterns in center-field presentations. Recently, Polich and Aguilar (1990) attempted to control for these factors using geometric patterns, and varying the size of the overall form and the number of the local elements. They found no consistent laterality effects for global/local detection, and for spatial frequency (defined by number of elements). Rather, hemispheric effects were mainly sensitive to the overall form (squares vs. rectangles) which interacted with number of elements. Polich and Aguilar interpreted their results as evidence against hemispheric differences in the processing of global/local aspects or spatial frequencies. There is however, some difficulty with their manipulation of number of elements. Kimchi (1982, 1990; Kimchi and Palmer, 1982) demonstrated a change in the perceptual organization of hierarchical patterns when the number of elements increased to 7 ± 2. Accordingly, stimuli composed of up to 4 or 5 elements are considered few-element patterns, while stimuli composed of more than about 7 elements are considered many-element patterns. Polich and Aguilar failed to follow this criterion consistently. Moreover, number of elements seemed to be confounded with congruency and overall shape. For example, their few- and many-element rectangles were composed of one and two elements respectively, while the few- and many-element squares were composed of four and sixteen elements respectively (see Polich and Aguilar 1990: fig. 1). It is possible then, that the results obtained in Polich and Aguilar's study are due in part to this confounding.

The purpose of the present study was twofold. First, to investigate hemispheric processing of global form and local form of hierarchical patterns composed of few and many elements. If the hemispheres differ in their sensitivity to more global versus more local aspects of visual patterns, then the same global/local lateralized effects are expected with few- and many-element patterns. If, however, a major functional difference between the hemispheres resides in their relative efficiency in processing high versus low spatial frequency information, as suggested by Sergent (1982, 1987), then lateralized global/local effects should be more pronounced with the many-element than with the few-element patterns because there is less overlap in spatial frequencies between the global and the local levels of many-element patterns than between the two levels of few-element patterns, due to the relative size of the elements. The second purpose was to examine hemispheric processing of texture.

Experiment 1

A Stroop-type paradigm was employed for two types of hierarchical patterns: those composed of few relatively large elements, and those composed of many relatively small elements. The stimuli were presented in the left visual field (LVF), central visual field (CVF), or right visual field (RVF). In separate blocks of trials subjects were to attend to the global or the local level and to identify, as quickly as possible, the form at the designated level.

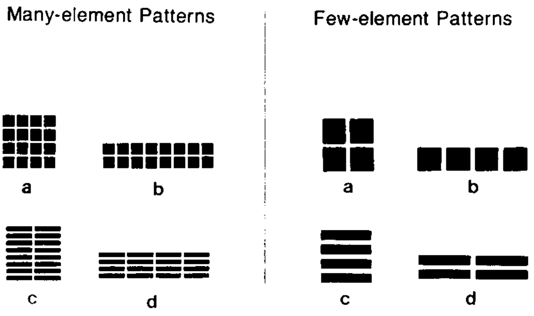

Fig. 1. The two sets of patterns used in experiment 1.

Method

Subjects

Sixteen females and sixteen males from 18 to 31 years old with normal vision served as subjects. Handedness was assessed by a short questionnaire (Bryden 1977). All subjects were right-handed.

Stimuli

Two sets of four patterns each were created by orthogonally combining two types of global configurations (square and rectangle) with two types of local elements (squares and rectangles). The two sets differed with respect to the number and relative size of the elements in a pattern. One set – the few-element set – consisted of patterns made up of 4 relatively large elements. The other set – the many-element set – consisted of patterns made up of 16 elements (see fig. 1). Each set contained two consistent stimuli in which the global and the local levels had the same identity (i.e., both global and local forms were 'squares' or both were 'rectangles', stimuli a and d), and two inconsistent stimuli in which the global and local forms had different identities (i.e., global 'square' made up of local 'rectangles', or global 'rectangle' made up of local 'squares', stimuli b and c). The stimuli were presented on an Apollo Domain DN500 microcomputer. Subjects sat 80 cm from the screen. From this position the global square subtended 1.5 degrees of visual angle, and the global rectangle subtended 3.01 degrees in width and 0.72 degrees in height. Each individual square element subtended 0.72 degrees in the few-element patterns and 0.36 degrees in the many-element patterns. Each individual rectangle element subtended 1.5 degrees in width and 0.34 degrees in height in the few-element patterns, and 0.72 degrees in width and 0.16 degrees in height in the many-element patterns. The stimuli appeared in black on a white background to ensure a fast decay, and were presented in the LVF, CVF, or RVF. In lateral presentations the center of the stimulus appeared 2.5 degrees from fixation.

Design

The five factors of the design were hand (right, left), pattern type (few-element, many-element), relevant dimension (global form, local form), consistency (consistent, inconsistent), and visual field (LVF, CVF, RVF). Half the subjects responded with their right hand, and the other half with their left hand. The subjects were all submitted to the same other four experimental conditions.

For each of the four combinations of pattern type and relevant dimension there was a block of 100 trials. Each block consisted of 4 warm-up trials which were not included in the analysis, followed by 96 experimental trials. Each block was preceded by 24 practice trials. Each stimulus pattern occurred an equal number of trials and appeared equally often in each visual field. The stimuli were presented randomly with the restriction that no more than four consecutive trials involved the same visual field or the same stimulus identity. Half of the subjects were presented first with the few-element set and then with the many-element set; the other half of the subjects received the reverse order. The relevant dimensions were administered in different blocks within each set. The order of the relevant dimensions was counterbalanced across subjects.

Procedure

Subjects sat with their heads resting on a chin-and-head rest that prevented head rotations. Before each block subjects were presented with the relevant stimulus patterns and were instructed to attend to one dimension (global form or local form). Subjects indicated the identity of the relevant form (square or rectangle) by pressing one of two keys with their second or third finger of the hand assigned to them. Half of the subjects were instructed to respond with their second finger to indicate a square and with their third finger to indicate a rectangle, and half of the subjects were given the opposite instruction. Subjects were instructed to look directly at the fixation point and not to move their eyes. They were urged to respond as quickly as possible while making as few errors as possible. After each practice and experimental block subjects were presented with their error rates.

The sequence of events for each trial was as follows. First a fixation cross appeared at the center of the screen for 500 msec. It was followed immediately by the stimulus which appeared for 150 msec. The next trial begun with the appearance of the fixation 3 sec after the termination of the previous stimulus. The subject's response time on each trial was recorded. There was a rest period of 2–4 min between each block. Altogether the experimental session lasted about 45 min.

Results and Discussion

All reaction time analyses to be reported were based on subjects' median latencies for correct responses. The error rate was very low (mean = 1.07%) and showed no indication of a speed–accuracy tradeoff. Errors were not analysed further.

The reaction time data were first analysed by a seven-factor analysis of variance (ANOVA), mixed design. The factors were hand, type of pattern, shape, relevant dimension, consistency, visual field, and gender. No significant effects involving hand, shape, and gender were obtained. Therefore the following analyses were collapsed over these variables. Mean reaction times for the many-element patterns and for the few-element patterns for each visual field presentations are plotted in fig. 2 as a function of the relevant dimension and the consistency between the two levels. Two

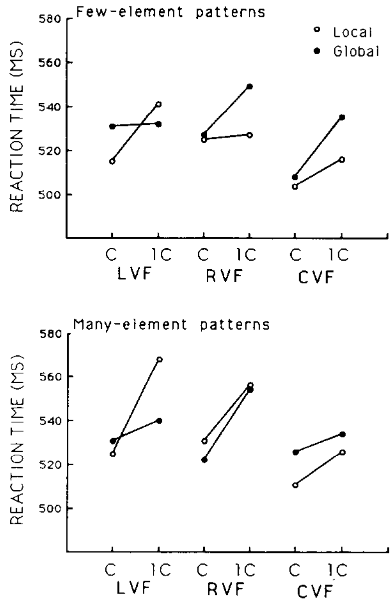

Fig. 2. Mean reaction times for few-element patterns and for many-element patterns as a function of dimension for consistent (C) and inconsistent (IC) stimuli in LVF, RVF, and CVF presentations in experiment 1.

separate analyses were performed; one analysis involved the RVF and LVF presentations, and the second analysis involved the CVF presentations.

Lateral presentations

A four-factor repeated measures ANOVA (Pattern × Dimension × Consistency × Visual field) indicated a significant effect of consistency, $F(1, 31) = 38.16$, $p < 0.0001$, and a significant interaction between dimension, consistency, and visual field, $F(1, 31) = 19.08$, $p < 0.0001$. No other main effect or interaction were significant. The interaction effect was present both with the few-element patterns, $F(1, 31) = 5.03$, $p < 0.05$, and with the many-element patterns, $F(1, 31) = 4.59$, $p < 0.05$. A breakdown of this interaction revealed a significant interaction between consistency and visual field for global identification, $F(1, 31) = 10.24$, $p < 0.0035$, and for local identification, $F(1, 31) = 10.79$, $p < 0.0025$. Local-to-global interference was larger in RVF presentations (averaged 28 ms) than in LVF presentations (averaged 5 ms), while global-to-local interference was larger in LVF presentations (averaged 35 ms) than in RVF presentations (averaged 14 ms) (see fig. 2).

Central viewing

A three-factor repeated measures ANOVA (Pattern × Dimension × Consistency) was performed on the RT data obtained for CVF presentations. The only significant effect was of consistency, $F(1, 31) = 11.56$, $p < 0.002$, indicating mutual interference effects between the two dimensions. These results are consistent with Kimchi and Palmer's (1985: exp. 4) findings of Stroop-type interference both with many- and few-element patterns when subjects were required to identify the global or the local form.

The present results for lateral presentations indicate that it was harder for the subjects to selectively attend to the global dimension, or alternatively, to ignore the local dimension, in RVF than in LVF presentations, while it was harder to selectively attend to the local dimension, or alternatively, to ignore the global dimension, in LVF than in RVF presentations. In the global/local literature relative speed of processing as well as interference effects are taken as indicators of superiority (e.g., Navon 1977). Thus, the present results with geometric forms are consistent with some previous findings with compound letters indicating that subjects were faster at global identifications when stimuli were presented to the left visual field (Sergent 1982), and faster at local identifications when stimuli were presented to the right visual field (Martin 1979b; Sergent 1982).

Contrary to the results reported by Polich and Aguilar (1990), the present results show lateralized effect for global/local processing but not for the overall form (i.e., squares versus rectangles). A possible reason for the discrepancies in the results might stem from the problem with Polich and Aguilar's manipulation of number of elements and its confounding with overall shape and congruency as discussed earlier.

The finding of no differential sensitivity to lateral presentations with the few- and many-element patterns, at least under the present task requirements, suggests that the two hemispheres differ in their relative efficiency in processing relatively more local aspects (left hemisphere) versus more global aspects (right hemisphere) of hierarchical patterns. This finding is seen to be inconsistent with Sergent's (1982, 1987) hypothesis when interpreted as hemispheric specialization for different ranges of absolute spatial frequencies. However, the present results may be compatible with a version of Sergent's hypothesis, namely that the hemispheres are predisposed to utilize the relatively high versus relatively low ranges of spatial frequencies contained in a particular stimulus (see Hellige 1990).

Experiment 2

The distinction between few-element patterns and many-element patterns allows us to examine the hemispheric processing of another aspect of hierarchical patterns, that of texture. It has been suggested already (see Introduction) that few-element patterns are perceived in terms of global form and figural parts, while many-element patterns are likely to be perceived in terms of global form and texture. Experiment 1 studied hemispheric processing of global and local forms. Experiment 2 was designed to study hemispheric processing of global form and texture. It has been proposed that form and texture perception are mediated by different processes and stimulus properties (e.g., Beck 1982; Treisman 1985). The question addressed in the present experiment is whether the difference in processing form and texture is reflected in respective competence of the two hemispheres.

Method

Subjects

Thirteen females and 19 males from 18 to 31 years old with normal vision served as subjects. Handedness was assessed by a short questionnaire (Bryden 1977). All subjects were right-handed.

Stimuli

Two sets of four patterns each were created by orthogonally combining two types of global configurations (square and rectangle) with two types of local elements (black-and-white squares and black-and-white rectangles). The many-element set consisted of patterns made up of 15, 29, and 85 elements. The square elements were arranged in a checkerboard design; the rectangle elements were arranged in a grating design. The few-element set consisted of patterns made up of 3, 4, and 7 relatively large elements arranged in a similar way, so that they can be viewed as magnification of a small area of the pattern in the many-element set (see fig. 3). The two consistent stimuli were stimuli a and d (note, however, that for stimulus d the global and local rectangles differ in orientation); the two inconsistent stimuli were stimuli c and b. Subjects sat 80 cm from the screen. From this position the global square subtended 1.57 degrees of visual angle, and the global rectangle subtended 2.86 degrees in width and 0.79 degrees in height. Each individual square element subtended 0.79 degrees in the few-element patterns and 0.18 degrees in the many-element patterns. Each individual rectangle element subtended 0.33 degrees and 0.79 degrees in width in the few-element and in the many-element patterns, respectively. (The height of the individual rectangle was equal to the height of the global configuration in which it was embedded.)

Design and procedure

The design and procedure were the same as in experiment 1. The only difference was that in the present experiment the stimulus' dimensions were presented as global

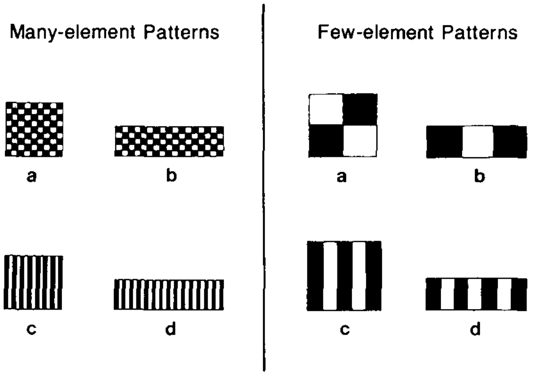

Fig. 3. The two sets of patterns used in experiment 2.

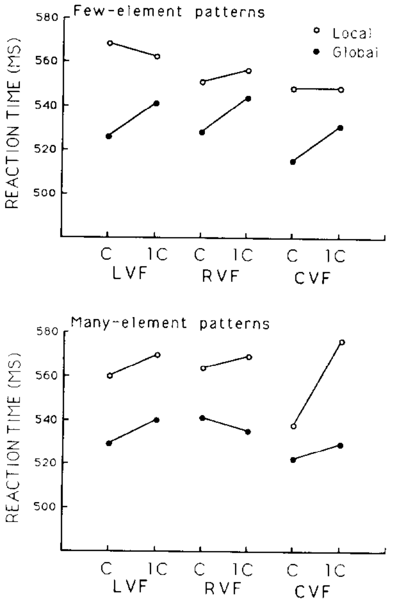

Fig. 4. Mean reaction times for few-element patterns and for many-element patterns as a function of dimension for consistent (C) and inconsistent (IC) stimuli in LVF, RVF, and CVF presentations in experiment 2.

form ('square' and 'rectangle') and texture ('checkerboard' and 'grating'). Subjects were instructed to attend to one dimension (global form or texture) and to decide which of its two levels was present in the stimulus.

Results and Discussion

The error rate was again very low (mean = 0.95%) and showed no indication of a speed–accuracy tradeoff. Errors were not analysed further.

The reaction time data were first analysed by a seven-factor ANOVA (Hand × Pattern × Dimension × Consistency × Visual field × Shape × Gender), mixed design. No significant effect involving hand or gender was found. The effect of shape was significant, $F(1, 31) = 6.32$, $p < 0.02$, and it interacted with pattern type, $F(1, 31) = 12.17$, $p < 0.0015$: Few-element squares were responded to faster than few-element rectangles, but there was no difference between responses to the two shapes in many-element patterns. No other interaction involving shape was significant. Therefore the following analyses were collapsed over these variables. Mean reaction times for the two types of patterns for each visual field presentations are plotted in fig. 4 as a function of the relevant dimension and the consistency between the two levels.

Lateral presentations

A four-way repeated measures ANOVA (Pattern × Dimension × Consistency × Visual Field) indicated a significant effect of dimension, $F(1, 31) = 10.37$, $p < 0.003$, and a significant effect of consistency, $F(1, 31) = 4.17$, $p < 0.05$. An overall global advantage was present both for the few-element patterns, $F(1, 31) = 5.26$, $p < 0.03$, and for the many-element patterns, $F(1, 31) = 9.34$, $p < 0.005$. A textural-to-global interference was observed with the few-element patterns, while no interference between the two dimensions was observed with the many element patterns, as indicated by the significant interaction between pattern, dimension, and consistency, $F(1, 31) = 7.44$, $p < 0.015$ (see fig. 4). The interaction between pattern, dimension, and visual field was also significant, $F(1, 31) = 4.25$, $p < 0.05$. A breakdown of this interaction revealed a significant interaction between dimension and visual field for the few-element patterns, $F(1, 31) = 4.26$, $p < 0.05$, but not for the many-element patterns, $F < 1$. As can be seen in fig. 4, with the few-element patterns local 'texture' was identified faster in RVF than in LVF presentations, while there was no difference in global identification between the two lateral presentations. No lateralized effects for either dimension were observed with the many-element patterns.

Central viewing

A three-way repeated measures ANOVA (Pattern × Dimension × Consistency) performed on the RT data obtained for CVF presentations indicated a significant effect of dimension, $F(1, 31) = 11.64$, $p < 0.002$, and a significant effect of consistency, $F(1, 31) = 14.42$, $p < 0.006$. Global form was identified faster than texture with both few- and many-element patterns, but the interference effects were in opposite direction: global-to-textural interference was observed with the many-element, while textural-to-global interference was observed with the few-element patterns, as indicated by the significant interaction between pattern, dimension, and consistency, $F(1, 31) = 9.95$, $p < 0.004$ (see fig. 4).

The present results for CVF presentations with the many-element patterns seem to contradict previous findings of Kimchi and Palmer (1985: exp. 1). They found that the dimensions of global form and texture were equally discriminable and perceptually separable, permitting selective attention to either dimension without interference from variation along the other irrelevant dimension. However, there are two important differences between their experiment and the present one. First, their experiment involved a speeded classification paradigm while the present one involved a Stroop-type paradigm. It has been suggested already that the two paradigms can produce differential interference effects (e.g., Kimchi 1988; Santee and Egeth 1980; Pomerantz et al. 1989), and that the Garnerian's speeded classification paradigm is the primary diagnostic for dimensional versus holistic processing (Kimchi 1988; Pomerantz et al. 1989). Second, stimulus exposure time was different. In Kimchi and Palmer's experiment the stimulus stayed on till the subject responded; in the present experiment the stimulus was briefly exposed for 150 msec. It is possible that the limited exposure duration made the local texture more vulnerable to global interference.

The overall global advantage observed in the present experiment, but not in experiment 1, may be due to the difference in the stimuli. The contour of the global form in the present stimuli was outlined while that of the stimuli used in experiment 1 was not (see figs. 1 and 3). This could contribute to the salience of the global level, irrespective of field of presentation.

The present results for lateral presentations with the few-element patterns indicated a relative RVF advantage for the local 'texture' (faster reaction times than in LVF presentations). These results replicated the RVF advantage for local detection observed with the few-element patterns in experiment 1. It should be noted though, that the lateralized effects observed in experiment 1 were in terms of asymmetric interference, and were present for global detection as well. In fact, we expected the present results with the few-element patterns to replicate those of experiment 1, because there is actually no texture in few-element patterns (inasmuch as a critical number of elements, around 7 ± 2, seems to be required for texture perception (Beck 1982; Kimchi 1982, 1990; Kimchi and Palmer 1982)). However, there are two differences between the two experiments which may account for the discrepancies in the results. First, the difference in the stimuli regarding the contour of the global form, as mentioned above. Second, the dimensional instructions in experiment 1 were equally compatible with each dimension. In the present experiment, on the other hand, they were more compatible with the global dimension than with the local one (granted, as mentioned above, that there is no texture in few-element patterns).

The present results for lateral presentations with the many-element patterns indicated no significant difference in texture identification and in global form identification between LVF and RVF presentations. Thus, neither processing of global form, nor processing of texture seem to be lateralized.

General discussion

The main purpose of the present study was to examine hemispheric processing of global form, local form, and texture of patterns composed of few, relatively large elements, and patterns composed of many, relatively small elements.

The results of the present experiments indicated a RVF/left hemisphere advantage for local form detection in terms of asymmetric interference (experiment 1), and in terms of relative speed of processing (experiment 2, few-element patterns), and a LVF/right hemisphere advantage for global form detection in terms of asymmetric interference (experiment 1). No lateralized effects were observed with texture identification (experiment 2, many-element patterns). In the two lateral fields of presentations texture identifications were significantly slower than global form identifications, and no interference between these two dimensions was observed.

The finding of similar lateralized effects for the identification of global and local forms with few- and many-element patterns suggests that the two hemispheres differ in their sensitivity to *more global* versus *more local* aspects of visual patterns. However, this differential sensitivity does not seem to apply to all local aspects. Experimental evidence suggests that texture perception depends on properties of the local elements (e.g., Julesz 1981; Treisman 1985; Beck 1982); yet, no hemispheric differences in texture identification were observed. This latter finding also seems to be inconsistent with Sergent's hypothesis that the hemispheres differ in their sensitivity to high versus low spatial frequencies. Clearly, the difference between local elements and local texture of many-element patterns is not a difference in spatial frequencies, and yet, detection of local form was lateralized while texture detection was not.

It has been suggested that form perception requires focused attention while texture perception can be accomplished by a distributed attentional system (e.g., Beck 1982). It follows that when we are comparing global form detection versus local form detection, we are comparing two tasks which share the same mode of attention (i.e., focused attention). On the other hand, when we are comparing global form detection versus texture detection (of many-element patterns), we are comparing different modes of attention (focused vs. distributed). If this is indeed the case, the finding of lateralized effects for global/local detection only when subjects had to detect global and local forms, but not when they were to detect global form and texture, has the following two implications for understanding functional differences between the two hemispheres. First, lateralized effects regarding global/local detection are more likely to be observed when the tasks require focused attention. Second, whatever the critical functional differences between the two hemispheres may be, they are unlikely to be in terms of different modes of attention.

Given the importance of stimulus factors for investigating hemispheric differences (e.g., Sergent 1983), it seems necessary to comment about the relation between number of elements and their relative size. For the stimuli used in the present experiments, the number of elements is correlated with their relative size for strictly geometrical reasons: increasing the number of elements necessarily results in decreasing their relative size as long as the overall size of the pattern is kept constant. One can separate the effect of relative size from that of number by constructing patterns in which there are only a few elements that are relatively small or large. Examining hemispheric processing of such patterns would be instructive. Unfortunately, however, it is impossible to completely isolate the effect of number from the effect of relative size because the complete orthogonal design combining number and relative size would require a geometrically problematic figure – a pattern composed of many relatively large elements (see Kimchi and Palmer, 1982). Also note that the confounding of number and relative size is not a problem for the many-element patterns of experiment 2 in which texture detection was examined, because texture is defined as a visual pattern composed of many identical elements (e.g., Beck 1982).

The exact nature of hemispheric specialization should await further research. There is also a need to arrive at a deeper grasp of the mode of processing reflected by different measures such as speed of processing and interference effect. Understanding the functional differences between the two hemispheres is by no means an easy task. It has become even harder and more complicated by realizing that hemispheric superiority is dependent on task demands and stimulus variables (e.g., Bradshaw and Nettelson 1981; Sergent 1983; Polich 1986; Hellige 1990). The present study demonstrated the potential contribution of analysis of stimulus structure and task demands for understanding such functional differences.

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