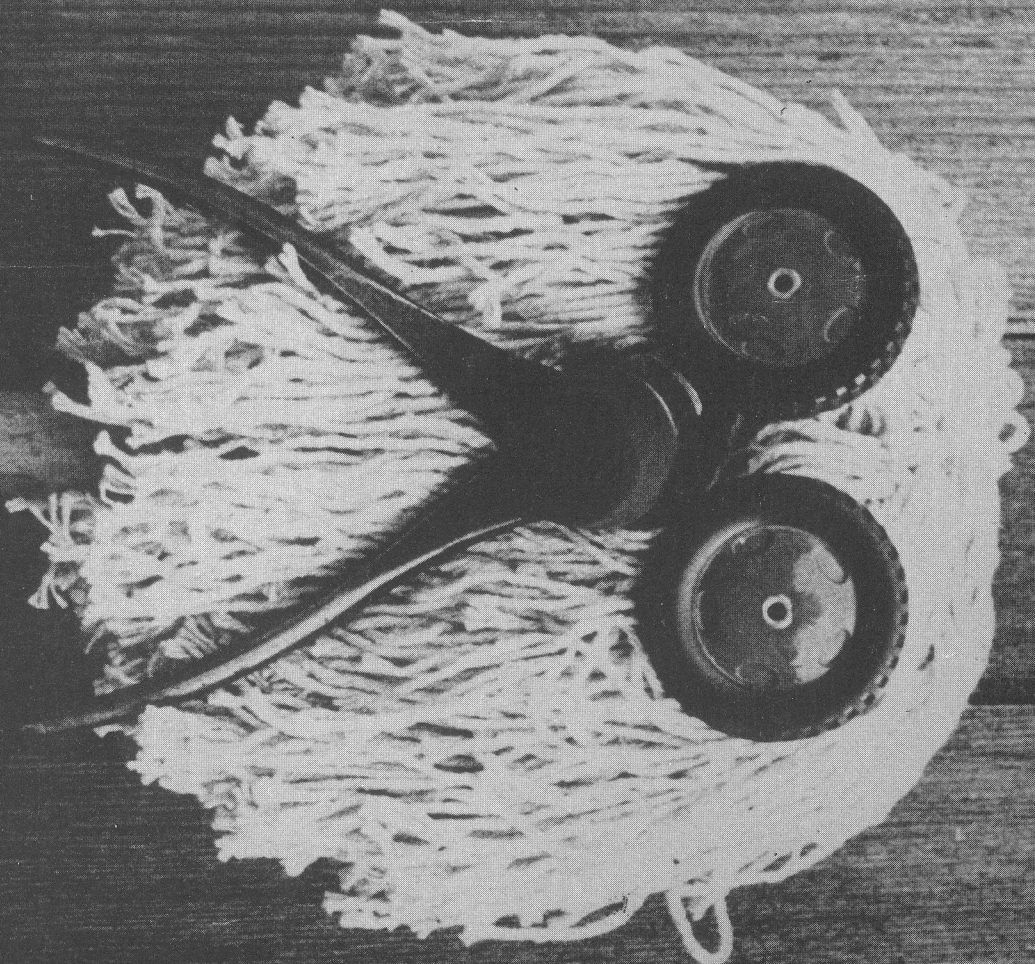


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## The reaction of monkeys to 'fearsome' pictures

THE phenomena a man or animal most needs to know and understand must often be potentially dangerous or disconcerting. We report here evidence that monkeys, given the opportunity to look at a picture which excites both interest and fear, choose first to look at it and only later, once their interest has abated, to avoid it.

We have measured the preference for a visual stimulus by allowing the monkeys to choose between looking at the test stimulus and a blank white screen of the same subjective brightness. In earlier experiments<sup>1,2</sup> we found that the response to an informative but affectively neutral stimulus, for example a repetitive loop of cartoon film, was typically an initial strong positive preference which declined within a few hundred seconds to relative indifference. By contrast, the response to an uninformative but unpleasant stimulus, such as a plain field of red light, was a strong and stable aversion. When a stimulus was both informative and unpleasant, for example a black and white film loop projected through a red filter, the monkeys' 'interest' overrode—so long as it lasted—their 'unpleasure'. The purpose of the present study was to find out what would happen with stimuli which now were deliberately chosen to be both informative and 'scaring'.

A television screen was used for displaying the stimuli, which were recorded on video-tape loops so that each action sequence was repeated approximately every 10 s. We made up 15 potentially fear-evoking stimuli, selected partly on the basis of our own hunches and partly on the basis of Hebb's suggestion<sup>3</sup> that 'anomalous' objects give rise to fear in primates. The stimuli included a toy snake, burning paper, a lavatory brush, a mop-head wearing a human mask and

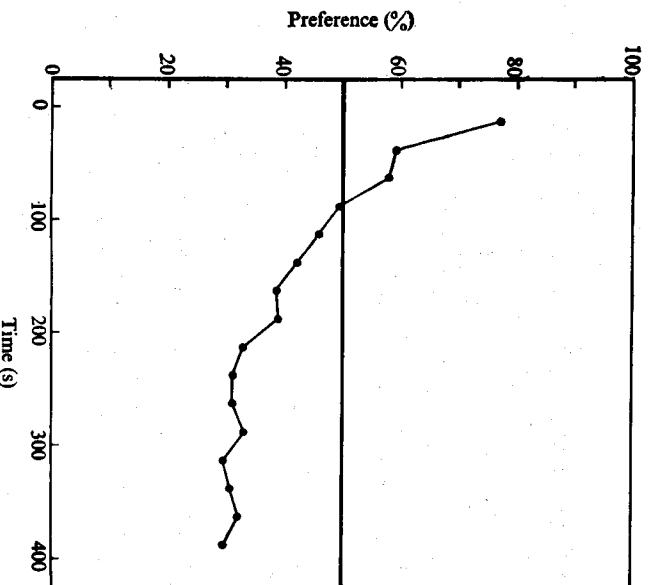


Fig. 1 Preference for 'fearsome' pictures (preference measured as the ratio of the total time spent with the test stimulus to the total time spent with either the test stimulus or the blank white screen).

other objects similarly bizarre. Each object was given some kind of life-like motion.

The method for measuring the monkeys' preferences has been described in detail in earlier papers<sup>1,2</sup>. The monkey sat in a small dark chamber with a television screen (37 cm × 30 cm) at one end, taking up most of the wall. On the screen

could be displayed either the test stimulus or a blank white field of the same subjective brightness. The monkey controlled the presentation of the two alternative stimuli by pressing a button: successive presses on the button produced the two stimuli in strict alternation, the stimulus staying on as long as the monkey held the button down. The test was terminated after 400 s exposure (at which point two peanuts were delivered). The monkeys worked eagerly and generally completed the test in under 500 s, alternating rapidly between the two stimuli (on average about 30 alternations per 100 s of exposure).

The subjects were five young male rhesus monkeys (*Macaca mulatta*). All had taken part in previous experiments on preference, in the course of which they had completed several hundred tests and had become thoroughly familiar with the apparatus and with the fact that strange stimuli were likely to be presented to them. They had, however, never before been deliberately exposed to fear-evoking stimuli.

The monkeys were tested with two new stimuli each day over a period of three weeks. It was immediately apparent from the results that it was not so easy to scare the monkeys as we had imagined. In fact in many of the tests there was no sign that the monkeys were anything other than interested in the stimuli. Since our aim was specifically to study the interaction of interest and fear, we needed to select for analysis only those tests in which we could be reasonably sure that the monkeys were indeed afraid. Independent indices of distress (cries, urination and so on) showed that the stimuli which the monkeys found most upsetting were, as might be expected, those to which they showed the greatest overall aversion. We decided therefore to treat any test in which the monkey's preference was predominantly negative as a case of the monkey being scared, and accordingly we defined a stimulus as being 'fearsome' to a particular individual if he chose to look at it for less than 200 s of the 400 s test. By this criterion, 13 of the 15 stimuli turned out to be fearsome to one or more of the monkeys, while the five individual monkeys were scared of eight, seven, seven, three and three of the stimuli, respectively.

Figure 1 shows the typical pattern of preference for 'fearsome' stimuli, as defined above, in each successive 25 s of the test. To obtain this graph we took for each monkey, the mean of his preference for those stimuli which were fearsome to him and then the mean of these means for the five animals. The point to notice is the time course. The characteristic pattern was for aversion to appear only after a short-lived positive preference. This pattern was fully borne out by the data from the individual tests: of the 28 tests in which the stimulus proved fearsome, the preference, taken over each successive 50 s, was positive for the first 50 s in 24 instances and negative for the last 200 s in every instance.

The pattern of preference was very similar, at least in quality, to that obtained with the red film loops in the earlier study<sup>2</sup>. We showed previously that the response to 'red films' could be accurately accounted for by a mathematical model which treats 'interest' and 'pleasure/unpleasure' as two separate factors which interact to determine behavioural preference, subject to a combinatorial rule which gives precedence to 'interest'. Our results suggested that the response to fearsome pictures might likewise be dually determined, and the intriguing possibility arose that we might be able to 'synthesize' the curve of Fig. 1 by using suitably chosen 'compound' stimuli in which we could separately identify components of interest and unpleasure.

To this end we undertook a second experiment in which we presented the monkeys with non-fearsome television

pictures to which an unpleasant auditory stimulus ('white noise') was added. The non-fearsome pictures consisted of 10 s video loops of relatively bland material, chosen to be roughly comparable in information content to the fearsome pictures. The white noise was set at an intensity level of

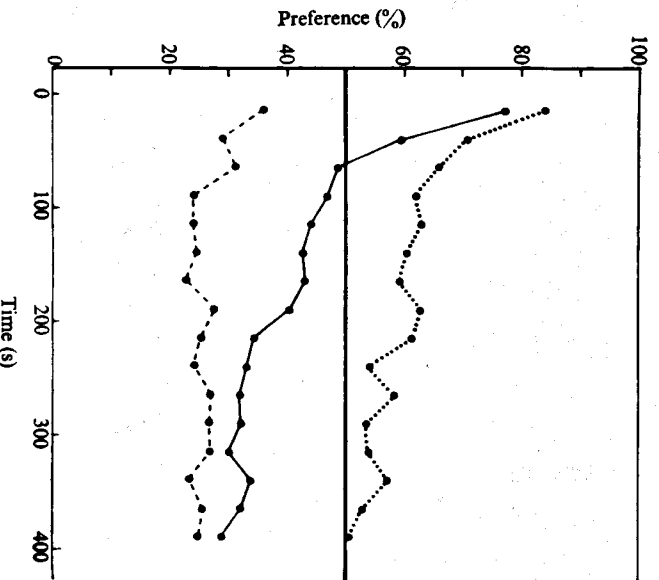


Fig. 2. Preference for, ●●●●●, 'picture only' (a choice between a non-fearsome, silent, video loop and the blank white screen); ●●●●●, for 'noise only' (a choice between the blank white screen plus white noise and the blank white screen without the noise); ○●●●○, for 'picture+noise' (a choice between a non-fearsome video loop plus white noise and the blank white screen without the noise). Monkeys were given 10 tests in each category, taken in rotation. Graphs show the means of the mean preferences of the five animals.

68 db (16 db above the background level of the testing chamber) which preliminary observations indicated would create an appropriate degree of displeasure.

The monkeys were given three categories of tests: 'picture only', 'noise only' and 'picture plus noise'. As Fig. 2 shows, the response to the pictures only was an initial strong positive preference which declined towards indifference; that to the noise only was a steady aversion (increasing slightly over the first 100 s of the test); that to the pictures plus noise was an initial positive preference which then turned into a marked aversion. In line with the predictions of the mathematical model, the response to pictures plus noise could be almost perfectly fitted by a theoretical curve computed from the separate responses to pictures only and noise only.<sup>1</sup>

Comparison of Figs 1 and 2 illustrates the close correspondence between the response to the fearsome pictures and that to the non-fearsome pictures plus noise. It seems fair to say that the 'fearfulness' of the fearsome pictures had on average the same effect as 68 db of white noise. But we believe there are grounds here for a stronger assertion, namely that at a causal level fearfulness influences behavioural preference in the same way as noisiness (or redness) through the evocation of a common factor of 'unpleasure', a factor which is strictly subservient to 'interest'.

In functional terms the lesson of these results seems clear: the benefits that come from increased understanding outweigh the immediate rewards of a comfortable life.

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<sup>1</sup> Humphrey, N. K., *Perception*, 1, 395-416 (1972).  
<sup>2</sup> Humphrey, N. K., *Perception*, 3 (in the press).  
<sup>3</sup> Hebb, D. O., *Psychol. Rev.*, 53, 259-276 (1946).