dominantly related to the size and proportion of macroscopic voids and, as illustrated in Fig. 4, is insensitive to total porosity volume. Thus high flexural strength is observed in specimens having a range of values of elastic modulus, 25–40 GPa.

Chatterji suggests that the properties of MDF cement are those of a polymer-modified paste. However, the strength values of MDF cement far exceed those claimed for pastes made at modest temperature and pressure in the presence of a water-reducing additive, with polymer addition or by polymer impregnation. Furthermore, the failure mode of MDF cement is brittle with no evidence of plastic deformation. Thus the improved properties of MDF cement are attributable to the altered pore size distribution of the inorganic matrix and are, as we indicate, independent of the chemical nature of the inorganic cement matrix. In this context, other work (in preparation) has shown that MDF cements can indeed be further modified to increase significantly the fracture toughness, with the result that flexural strength is raised still further to levels exceeding 150 MPa. The absence of macroscopic voids is an essential prerequisite for the attainment of such very high strength.

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Can passive tactile perception be better than active?

PASSIVE tactile perception has invariably been found to be equal to or inferior to active tactile perception[1–3]. An exception has recently been reported in an experiment by Magee and Kennedy[4] who guided the finger of each blindfolded subject around raised-line drawings of common objects. These (passive) subjects were able to identify more of the drawings than the active subjects whose fingertip movements were unguided. Magee and Kennedy suggest that "the act of planning may draw on the limited resources of the haptic system so that less processing capacity is available to monitor and distinguish relevant from irrelevant kinaesthetic input".

We consider this to be an implausible explanation of active inferiority for the following reasons:
(1) The "act of planning" is more cognitive than sensory. No evidence is provided to support the idea that, in this experiment, such planning can be expected to interfere with (or draw on limited resources of) the haptic (sensory) system.
(2) The resources of the haptic system must be limited at some level of task complexity but the job it was required to do in this experiment should be well within its capacity. When all fingers are simultaneously engaged in palpating an object, the channel is apparently not overloaded. Why should movements on one fingertip tax the system to the degree that planning of such movements proves too much? Moreover, Shiffrin *et al.*[5] present rather convincing evidence for an "unlimited-capacity nonattentional model of tactile perceptual processing".
(3) Presumably, "relevant" kinaesthetic input comes from movements made when the fingertip faithfully follows the raised line and "irrelevant" inputs from errors (straying from the line). But surely deviations are important error signals which guide ensuing movements rather than act as "irrelevancies". Information is gained either way.
(4) The comparison being made was not simply between active and passive haptic conditions. Rather, because haptic information was so (unusually) impoverished, conscious attention was necessary to build up a "picture"—for both passive and active subjects—but active subjects suffered the disadvantage of also having to plan movements.

In a different experiment, it was shown that when passive and active subjects are yoked in a tactile maze exploration task, the performance of active subjects suffers because they have the responsibility of regulation (planning) of movements[6]. This experiment, and that of Magee and Kennedy, showed that it is possible to demonstrate interference at the cognitive level when information is transmitted by the haptic system—not that passive tactile performance is better than active.

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MAGEE AND KENNEDY REPLY—Richardson and Wuillemin argue that our experiments did not establish superior passive tactile perception in the identification of raised-line drawings. They base their claim on studies with tactile finger mazes in which they found passive exploration to be superior to active exploration, and were then able to show that passive superiority was due to a cognitive factor, that is, the act of planning exploratory activity. They argue that passive superiority with raised-line drawings is also due to this cognitive factor.

Modern theorists recognize that planning and anticipation are crucial to perception, and we too recognize this as a critical component of haptic perception. However, the crucial problem for present purposes is that Richardson and Wuillemin's conclusion is based on superficial similarity between two types of tasks rather than on fundamental principles of haptic perception.

Clearly, Richardson and Wuillemin's finger-maze learning could be solved as a verbal sequence of eight discrete left–right turns[1], a number within the bounds of short-term memory. In contrast, the identification of raised-line drawings involves complex shape information that is not discrete. Our subjects had to deal with a line continuously varying in location, direction and extent, that is, the task required the subject to integrate across time subtle spatial information that was difficult to encode verbally. Integrating all this information was not easy, as shown by the generally low levels of performance on this task. These low levels of performance indicate (contrary to Richardson and Wuillemin's assertion, made without supporting evidence) that our single-finger task was not facile and was not well within haptic capacities. Richardson and Wuillemin's task has little to do with perception, while identifying shape and form is the *sine qua non* for haptic perception.

Our task was one of haptic perception in which we have shown passive superiority.

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