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Physiological effects of emotion: assessment via hypnosis

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Assessment of the physiological effects of physical and emotional stress has been hampered by a lack of suitable laboratory techniques. Since hypnosis can be used safely to induce specific emotional states of considerable intensity, we studied the effect on distal colonic motility of three hypnotically induced emotions (excitement, anger, and happiness) in 18 patients aged 20–48 years with irritable bowel syndrome.

Colonic motility index was reduced by hypnosis on its own (mean change 19·1; 95% CI 0·8, 37·3; $p<0·05$) and this change was accompanied by decreases in both pulse (12; 8, 15) and respiration (6; 4, 8) rates ($p<0·001$ for both). Anger and excitement increased the colonic motility index (50·8; 29·4, 72·2; and 30·4; 8·9, 51·9, respectively; $p<0·01$ for both), pulse rate (26; 22, 30; and 28; 24, 32; $p<0·001$ for both), and respiration rate (14; 12, 16; and 12; 10, 14; $p<0·001$ for both). Happiness further reduced colonic motility although not significantly from that observed during hypnosis alone. Changes in motility were mainly due to alterations in rate than in amplitude of contractions.

Our results indicate that hypnosis may help in the investigation of the effects of emotion on physiological functions; this approach could be useful outside the gastrointestinal system. Our observation that hypnosis strikingly reduces fasting colonic motility may partly explain the beneficial effects of this form of therapy in functional bowel disorders.

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Introduction

Investigation of the physiological effects of physical and emotional stress is difficult for several reasons. For example, different forms of stress have different effects, as shown clearly in the gastrointestinal tract. Acute physical stress (eg, immersion of a hand in cold water) inhibits antral and

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duodenal motor activity,[1] stimulates isolated pyloric pressure waves,[2] delays gastric empyting,[3,4] slows small-bowel transit,[5] and increases rectosigmoid motor activity;[6] whereas mental stress (eg, the dichotomous listening test) accelerates small-bowel transit[7] and has no effect on gastric emptying.[7] Moreover, these and other forms of laboratory-induced stress may not be relevant to everyday life. Another drawback is that subjects adapt rapidly to these techniques, so repeat studies cannot be done in the same individual.

Stress interviews have been used to assess the effect of emotions such as anger on colonic motility.[8,9] In these studies feelings of anger or aggression increased colonic motility[8,9] whereas hopelessness had the opposite effect.[8] Although these techniques may be more relevant to stress experienced in real life, they can produce different emotional reactions in different people, thereby hindering analysis of the effect of specific emotions on motility. Some of the methods used to elicit the required emotion may also be unethical.[8] Finally, it is almost impossible to investigate the effect of emotional states such as happiness or excitement on gastrointestinal motor function because of difficulties in reproducing these emotions in the laboratory.

Hypnosis does not have these disadvantages and can provide a safe and highly reproducible way of inducing specific emotional states. In this study we sought to investigate the effect of hypnosis on colonic motility and to determine the results of various hypnotically induced emotions.

Patients and methods

Patients

We studied 18 patients with irritable bowel syndrome (5 male, 13 female, aged 20–48 [median 36] years). All patients had a history of abdominal pain, abdominal distension, and altered bowel habit for at least 2 years continuously and none had any evidence of organic disease on standard laboratory investigation. They were recruited from our hypnotherapy treatment programme for refractory irritable bowel syndrome and all had previously undergone two hypnotherapy sessions. No patient was taking any drug known to effect gastrointestinal motility, and all gave their fully informed consent before participating in the study. The equipment conformed to the safety standards laid down by the Department of Health and the study was carried out in accordance with the Declaration of Helsinki and with the approval of the district ethical committee of the South Manchester Health Authority.

Experimental protocol

On the morning after an overnight fast, a solid-state catheter (Gaeltec Ltd, Isle of Skye, Scotland) was introduced via a colonoscope to a distance of 35 cm from the anus with minimum air inflation. Bowel preparation was not used. The catheter had five pressure transducers at 0, 5, 10, 15, and 20 cm from the distal end arranged radially around the circumference. During the withdrawal of the colonoscope, suction was applied to remove any air introduced into the colon. We did not sedate the patients and none complained of undue discomfort during the procedure.

With the catheter in place, patients were placed in a semirecubment position and allowed to rest for at least 30 min. Fasting colonic motility was then recorded for 15 min before the patients were hypnotised. For five consecutive 15-min periods we induced alternately relaxation (control periods) or emotion (anger, excitement, or happiness). Each patient underwent two of the hypnotically induced emotional states. Order and selection of emotions were randomised, 14 patients undergoing hypnotic happiness, 11 hypnotic anger, and 11 hypnotic excitement. Pulse and respiration rates were recorded during the last 5 min of each 15-min period as an independent measure of the patients' response to the emotions.

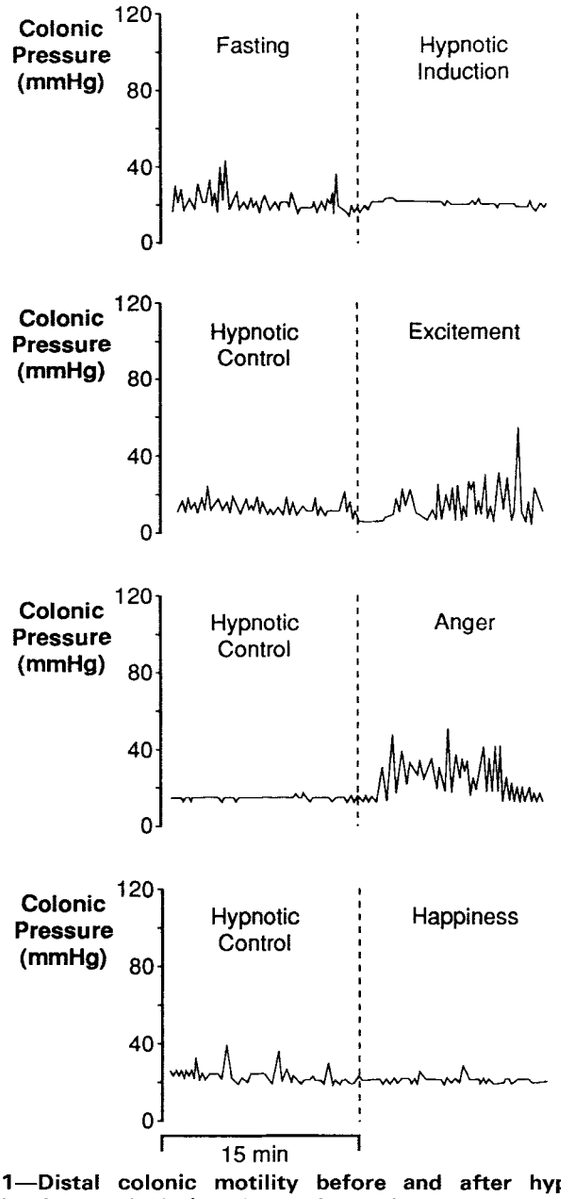

Fig 1—Distal colonic motility before and after hypnotic induction and during hypnotic excitement, anger, and happiness.

Hypnosis technique

Hypnosis was induced by an eye-fixation technique followed by standard deepening procedures,[10,11] and subsequent emotional changes were induced by direct suggestion from the hypnotherapist. During hypnosis it is sometimes hard for the patient to generate spontaneously the required emotion. To overcome this difficulty, we asked the patients in advance to describe various circumstances that would give rise to an appropriate emotional response. This approach had the added advantage that the therapist could constantly reinforce the emotion during the session. At the end of the study we asked the patients to confirm that the required emotion had been induced. For patients who experienced anger in the last phase of the study, we took the precaution of inducing a pleasant emotional experience before waking them.

Pressure recordings

The solid-state catheter was connected to an IBM-PC computer via an analogue-digital converter (PC-Polygraph, Synectics Medical, Stockholm, Sweden).[12] The prehypnosis fasting, hypnotic control, and emotion periods were analysed to yield values for (*a*) the number of pressure waves greater than 20 mm Hg in each period;[12] (*b*) the mean amplitude of the pressure peaks in each period; and (*c*) the motility index calculated from the product of mean amplitude and percentage duration of activity in each period.

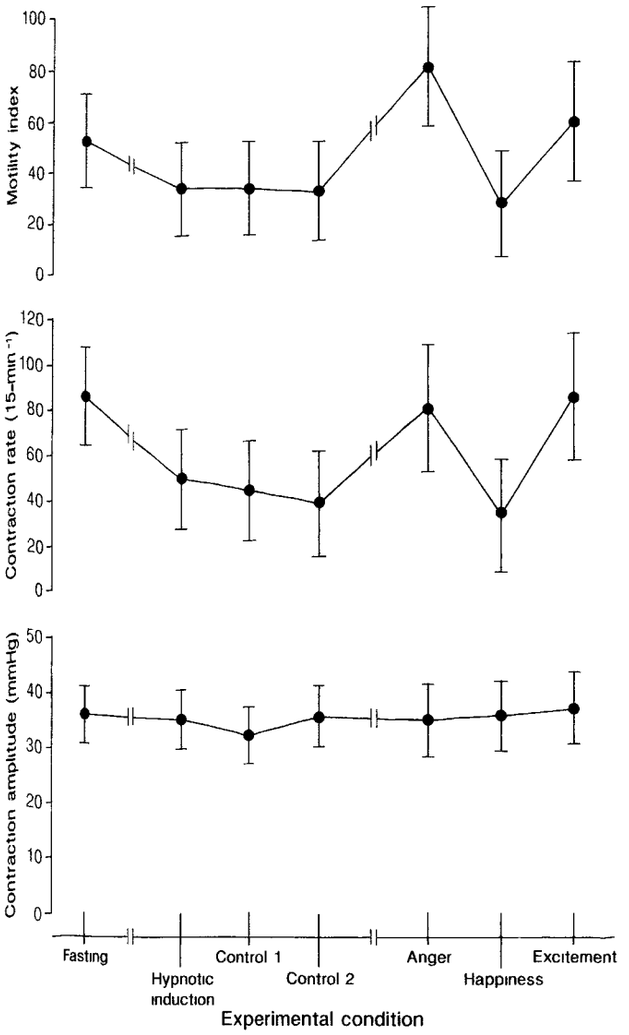

Fig 2—Effect of hypnotic induction/control, anger, happiness, and excitement on colonic motility index, rate, and amplitude of contractions.

Results expressed as mean and 95% CI. Motility index F(6, 86) = 7·284, p < 0·017; contraction rate F (6, 82) = 6 780, p < 0·021; contraction amplitude F (6,79) = 0·951, p not significant.

For each of these measures data for all five pressure channels, representing colonic pressure activity from 15–35 cm from the anus, were summated.

Statistical analysis

Each of the five variables (prehypnosis fasting, hypnotic induction/control 1 and 2, and hypnotic anger, excitement, and happiness) was analysed separately with a single factor (unbalanced) repeated measures analysis of variance (ANOVA). The factor used was "induced state" (prehypnosis fasting, hypnotic induction/control, or hypnotic emotion). There was no evidence that the order in which the various emotions were induced affected the outcome, so this factor was omitted from the final statistical evaluation. The Greenhouse-Geisser correction was applied for evaluation of the ANOVA tables. When appropriate, differences between the various induced states were examined in detail with the Tukey multiple comparison test. Adequacy of each analysis was confirmed with a half-normal probability plot; none of the five variables required transformation before evaluation. All calculations were done with the GLIM 3.77 program.

Results

Effect of hypnotic induction

Colonic motility—Hypnosis strikingly reduced fasting distal colonic motility, as measured by motility index (mean change 19·1, 95% CI 0·8, 37·3, p < 0·05; figs 1 and 2). This reduction was caused by a decrease in rate (p < 0·001) rather than mean amplitude of contractions (fig 2). Motility measurements during the subsequent hypnotic control periods 1 and 2 between episodes of induced emotion did not significantly differ from the values obtained during hypnotic induction.

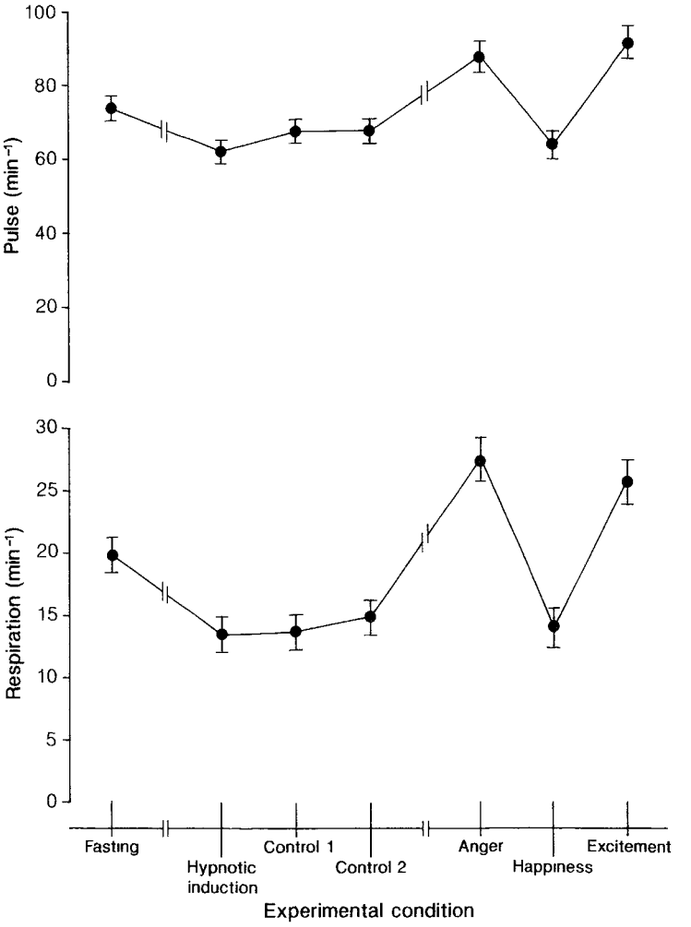

Fig 3—Effect of hypnotic induction/control, anger, happiness, and excitement on pulse and respiration rates.

Results expressed as mean and 95% CI. Pulse F (6, 84) = 53·327, p < 0·001; respiration F (6, 84) = 59·112, p < 0·001.

Cardiorespiratory variables—Both pulse (mean change 12; CI 8, 15) and respiration (6; 4, 8) rates were reduced by hypnosis (p < 0·001 for both; fig 3). During the second hypnotic control period, pulse was higher than during hypnotic induction (p < 0·05). No such change occurred in respiration.

Effect of hypnotic anger, excitement, and happiness

Colonic motility—Colonic motility index was increased by induction of either excitement (30·4; 8·9, 51·9; p < 0·01) or anger 50·8; 29·4, 72·2; p < 0·01) by comparison with hypnotic induction/control periods (figs 1 and 2). The motility index during hypnotic anger was greater than that during the prehypnosis fasting period (p < 0·01). These changes were related to increases in rate (p < 0·01) rather than mean amplitude of contractions (fig 2).

By contrast, induction of happiness decreased colonic motility index compared with the prehypnosis fasting period (p < 0·01); a further decrease relative to the hypnotic induction/control periods was observed but was not statistically significant (figs 1 and 2). These changes likewise reflected a decrease in rate (p < 0·01 relative to fasting) rather than mean amplitude of contractions (fig 2).

The colonic motility index was increased more by anger

than by excitement ($p < 0.05$; fig 2). Both anger and excitement were associated with a greater rate of contractions and consequently an increased motility index compared with happiness ($p < 0.001$ in all instances; fig 2).

Cardiorespiratory variables—Excitement and anger increased pulse (28; 24, 32; and 26; 22, 30) and respiration (12; 10, 14; and 14; 12, 16 respectively) rates compared with the hypnotic induction/control and prehypnosis fasting periods ($p < 0.001$ for all comparisons; fig 3). Respiration rate was higher during anger than during excitement ($p < 0.05$). Happiness had no consistent effect on either variable compared with induction/control periods but reduced both variables compared with the prehypnosis fasting period ($p < 0.001$; fig 3).

Discussion

We have shown that hypnosis can be used to induce various emotions, and that different emotions have different effects on colonic motility. The increase in colonic motility caused by anger accords with earlier studies in which other techniques were used to induce this emotion.[8,9] Excitement and anger had similar effects on the colon whereas happiness tended to reduce colonic motility. These observations may help to explain everyday experiences such as frequency of defaecation or abdominal cramps during especially stressful events and their subsequent amelioration when calmness ensues.

Some might argue that hypnotically induced emotion is a "passive" event unassociated with somatic physiological responses. Our data support a true reproduction of emotion since patients had the anticipated changes in pulse and respiration rates, as well as changes in colonic motility. Moreover, although not all the emotions we describe have been studied previously, our results on the effect of anger on colonic motility accord with earlier reports.[8,9]

Techniques for inducing stress and emotion often bear little resemblance to everyday life. Hypnosis provides a way of inducing a wide variety of specific emotions, including those such as excitement and happiness that have hitherto been very difficult to reproduce in the laboratory. Before induction of hypnosis in a patient, it is important to establish the triggers for each emotional response. This information allows the therapist to intensify and reinforce the emotion during the study and provides the opportunity to terminate the session should the subject become unduly distressed. However, none of our patients had any reservations about their experiences.

Although this study was not concerned with the therapeutic aspects of hypnosis, a striking observation was that induction of hypnosis led to a profound reduction in colonic motility. This effect, and earlier reports indicating that hypnotherapy seems to restore rectal sensitivity to normal in patients with irritable bowel syndrome,[13] may partly explain the beneficial effect of hypnosis in this disorder.[14,15] There is no knowing whether the effect of hypnosis on colonic motility persists when the patient is not in the hypnotic state. Our results, with the gut as an example, indicate that hypnosis may be a useful tool for investigating the effect of emotional states on physiological mechanisms. The next step is to incorporate pharmacological manipulations to determine which pathways are involved in the mediation of these physiological changes.

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From The Lancet

Antipodean tipple

Our large colony, Australia, much to her credit, produces many good things and now, it would appear, she promises to vie with countries of established reputation in the production of not only excellent clarets, burgundies and ports, but also of sound, honest brandy. We have received a sample of a consignment of brandy recently shipped from Melbourne which our analysis and examination show to be of a fragrance, purity and quality second to none. The importance of this new departure can hardly be over-estimated when we are confronted with the fact that genuine grape brandy has, according to many official reports, become almost a thing of the past. In 1890 the vice-consul at Rochelle warned the British public that real cognac was then scarcely obtainable and what was sold as such was usually spurious. This statement of course caused much annoyance in the Charente district, where alone cognac is made, and sundry contradictions were published; but the consul, Mr Warburton, in a more recent report, adheres to it and says that little as there was before of cognac brandy, there is less now. . . . Since the unfortunate ravages of the phylloxera there has been an immense falling-off in the shipments of brandy from the cognac district. It is a significant fact, however, that in the importation of so-called brandy there has been no falling off whatever and there is little doubt that the term "brandy" (*branntwein*) is now extended in its application so as to include spirit distilled from maize, rice and other cereals, as well as from potatoes, turnips and beetroots. The introduction of a genuine grape brandy, therefore, more particularly from our own dependencies, is a matter not merely of commercial importance, but one of especial interest to medical men, who have oftentimes to resort to it as a most valuable and powerful remedial agent.

(July 2, 1892)