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# Perceived control, locus of control and preparatory information: effects on the perception of an acute pain stimulus

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**Abstract**

This study investigated the effects of differences in a pre-procedure briefing (providing or withholding preparatory information and explicit control) on the perception of the second of two identical acute pain stimuli. 61 healthy participants were allocated to one of three conditions: Information + Control (I+C), Information - No Control (I-NC) or No information - No Control (NI-NC).

Baseline measures of Pressure Pain Threshold (PPT) and pain rating using Visual Analogue Scales (VAS) were taken, as was a measure of general internal/external Locus of Control (LOC). Participants were read the briefing and subjected to a second pain stimulus of identical intensity to their baseline measures. Participants rated the second stimulus using the VASs, and compared it to the first using comparison scales.

Results show that differences in a pre-procedure briefing significantly altered participants' perception of the pain stimulus. Participants in the I-NC group rated the second stimulus more painful than the first, and participants in the NI-NC group rated the second stimulus as less painful than the first. There is also suggestive evidence that these differences may relate to individual LOC style. We recommend encouragement of patient participation to engender at least the perception of control in clinical situations involving acutely painful procedures.

*Keywords:* Pain, Pressure Algometry, Locus of Control, Perceived Control, Information.

**Introduction**

A large body of research has examined the influences of psychological factors on the experience of acute pain. Among the key factors involved are perceived control (Chapman & Turner, 1986; Thompson, 1981; Weisenberg, 1998), locus of control (LOC) (see for example Crisson & Keefe, 1988; Harkapaa, Jarvikoski, Mellin, Hurri, & Luoma, 1991; Weisenberg, 1998), and preparatory information (Weisenberg, Wolf, Mittwoch, Mikulincer, & Aviram, 1985). However, studies investigating these factors have yielded contradictory or unreplicated results that suggest that the effects of these factors, particularly preparatory information, are complex and probably interactive (Craig & Best, 1977; Leventhal, Brown, Shacham, & Engquist, 1979; Weisenberg, 1998; Weisenberg et al., 1985).

Perceived control has been defined as "the belief that one has at one's disposal a response that can influence the aversiveness of an event" (Thompson, 1981, p.90) and is known to be a contributory factor in the perception and reporting of acute pain (Litt, 1988; Miller, 1979, 1980). Control may be perceived as instrumental, where a behavioural response is available, or cognitive, where a cognitive strategy is available (Litt, 1988; Thompson, 1981). It is important to note that control need not actually be provided, it simply needs to be perceived to be available (Law, Logan, & Baron, 1994; Litt, 1988; Thompson, 1981).

Control is an issue in acutely painful clinical situations. People admitted to hospital or undergoing medical examination tend to take a submissive psychological stance, adopting the 'patient role' (see Pickering & Friedman, 1991; Pitts, 1993b; Taylor, 1979). Particular features of the patient role are reduction in personal control, reduction in self-efficacy and depersonalisation. The adoption of the patient role can be facilitated further by the style of language adopted by clinical staff. A mature adult who may be used to hold a position of great responsibility is asked to 'pop into bed and slip off your clothes so we can look at your tummy' (Pitts, 1993a).

General Locus of Control (LOC) has been shown to be a determinant of response to acute pain. LOC may be described as a general principle that a persons' attempts to control their personal environment are influenced by internal or external factors. More specifically, the extent to which an individual believes that events within their personal environment are under their own control or are controlled by external circumstances (e.g. luck, fate or powerful others). In general, a more internal LOC is associated with higher pain tolerance and less negative pain response (e.g. Craig & Best, 1977; Crisson & Keefe, 1988; Roome & Humphrey, 1992; Toomey, Mann, Abashian, & Thompson Pope, 1991). In clinical situations a more internal LOC is associated with more positive clinical outcomes (Bates & Rankin Hill, 1994; Harkapaa et al., 1991; Reynaert et al., 1995), and in common with introversion and extroversion, LOC has been found to relate to analgesic usage in the control of acute (e.g. post-operative) pain (Reynaert et al., 1995; Roome & Humphrey, 1992). Patients with a more internal LOC style requiring lower and less frequent doses.

There is evidence that general LOC is related to self-efficacy (Rokke, Al Absi, Lall, & Oswald, 1991); those with a more internal LOC tend to have a stronger sense of self-efficacy. Litt (1988) showed that performance in a cold pressor task was best in participants with both high levels of perceived control and high levels of self-efficacy. Litt concludes that those who are most confident that they can exercise control tend to benefit most from it. Lefcourt (1980) notes that in general, people who have been assessed as holding more external LOC tend to behave in ways that are congruent with descriptions of helplessness. They are less likely to seek information, are less likely

to utilize information that is available, and are less likely to demonstrate positive affective states than are internal LOC individuals. More health specific measures of LOC (e.g. the Multidimensional Health Locus of Control) relate less well to general self-efficacy, and may have limited use in the study of pain (Skevington, 1995).

Preparatory information has been shown to influence pain response. Although evidence for the nature of its influence is often contradictory, there is some indication that the effect of preparatory information is dependent upon personality type. For example Weisenberg et al. (1985) showed that information allowing predictability resulted in high trait anxiety participants reporting more pain than low trait anxiety participants. Miller and Mangan (1983) investigated the interacting effects of personal dispositions and situational conditions on the stress response. They divided forty patients about to undergo a benign gynaecological procedure into two groups based on a tendency to seek information (monitors) or avoid information (blunters). They reached three conclusions. First that voluminous preparatory information may exacerbate patient distress. Second, that being a monitor, in the context of their study, was a more arousing coping style than being a blunter, resulting in greater stress. Third, that variations in coping style interact with and determine the impact of preparatory information on coping skills. They suggest that this third conclusion helps to make sense of conflicting results among previous studies in which information sometimes had a stress inducing and sometimes a stress reducing effect. Miller and Mangan suggest that overall, patients are generally less stressed when the information with which they are presented is consonant with their coping styles; low levels of information for blunters and high levels of information for monitors.

To summarize, factors associated with differences in the perception of pain stimuli include the perception of control, LOC style and the availability of preparatory information. The perception of control is generally associated with less negative responses to painful stimuli, particularly in participants with a more internal LOC (i.e. those that have the confidence to employ control). Providing preparatory information is generally seen to have a stress reducing effect. However, it has been suggested that the ultimate effect of preparatory information upon the perception of a pain stimulus depends upon the personality traits of the participant (such as LOC style and self-efficacy). It has been suggested that whilst providing preparatory information may result in a less negative evaluation of a pain stimulus for those who are given the means to act upon that information and have the confidence to utilize it, preparatory information may result in a more negative evaluation of a pain stimulus in those who doubt their ability to utilize it, or who are denied the perceived means to act upon that information. In short, the ultimate effect of information depends upon characteristics of the individual. Those who seek information show less distress and lower levels of pain when it is provided. Those who avoid information cope better and show lower levels of pain when it is withheld (Law et al., 1994; Miller & Mangan, 1983; Weisenberg et al., 1985).

The purpose of the present study was to examine the effects of differences in a pre-procedure briefing relating to perceived control and preparatory information on the perception of the second of two identical pain stimuli. The hypotheses were that participants in the control group who were provided with both information and explicit control would rate the second pain stimulus the same as the first; that participants provided with information providing predictability with respect to the impending stimulus intensity, but denied any explicit means of influencing it would rate the second of two identical pain stimuli as being more painful compared to the first. This would support the argument that preparatory information without perceived control can act as a stressor. Further, it

was predicted that pain ratings from participants denied both preparatory information and perceived control, having nothing explicit to influence their coping strategy, would depend on their individual LOC (those with a more internal LOC providing lower pain ratings than those with a more external LOC).

**Method**

*Design*

Using a mixed 3 (conditions) x 2 (measures) design, three experimental conditions were generated using verbal briefings. The conditions were Information plus Control (I+C) (control condition), Information but No Control (I-NC) and No Information and No Control (NI-NC). For the purposes of this study, preparatory information was designed to provide predictability with respect to the intensity of the impending stimulus and was either provided or withheld. Control was defined as the explicit authority to stop the trial using a verbal signal (instrumental control). The briefing was designed to place explicit control either in the hands of the experimenter or the participant. It is important to note that overall control (the option to halt or withdraw from the experiment) was never withheld from participants, only the perception of control.

*Participants*

The participants were 61 healthy volunteers recruited from the staff of the Royal Free Hospital, Hampstead NHS Trust. Volunteers had responded to advertisements placed on the medical school and hospital staff notice-boards. The sample consisted of 20 males and 41 females (mean age 29.10 years, SD 7.04 years, range 19-50 years). 7 were left handed; 4 male, 3 female. The experimenter was a white male, 37 years of age.

*Materials*

Pressure Pain Threshold (PPT) was measured using a pressure algometer which applies a scalable force via a 1.5cm straight edge rounded to 0.5mm radius (1mm dia.) to the lunula of the nail (Figure 1).

The force applied is read from a digital display (invisible to participants during use) calibrated in grams and is measured to be accurate to $\pm 0.1\%$. The force was increased at a rate of approximately 100 g/s$^{-1}$ as measured by the sweep hand of a watch. Participants were required to report the point at which the increasing force became painful. Subjective pain ratings were collected using 10cm Visual Analogue Scales (VAS), the verbal anchors of which were from *no pain* to *worst pain imaginable*. Participants were required to compare the second of two identical pain stimuli with the first using a five-point Likert type scale from 1 (*much less*) to 5 (*much more*).
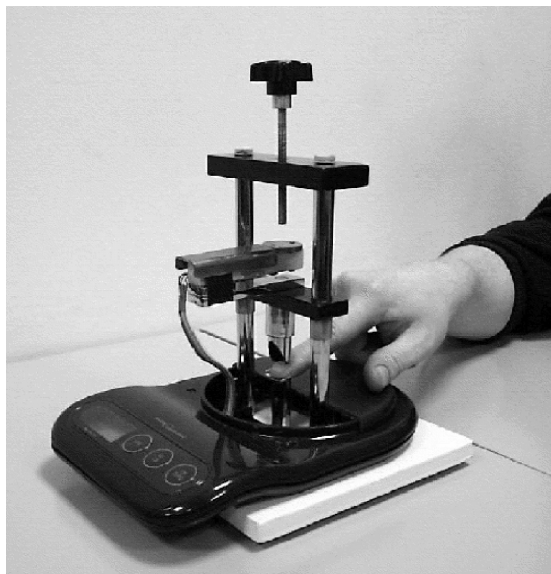
Fig. 1. The nail-bed pressure algometer, shown in start position.

*Procedure*

Participants were allocated randomly to one of the three conditions and were tested individually. Each participant was instructed on the use of the scales and informed fully of their rights to halt the study and withdraw at any time. Participants were then given an initial verbal briefing (the same for each condition), instructing them on what would happen and how to halt the trial. After a familiarization trial using their non-dominant hand, baseline PPT (dominant hand) and VAS measures were taken, after which participants completed the Internal/External Locus of Control Questionnaire (Rotter, 1966).

After completing the questionnaire, participants were presented with one of three verbal briefings designed to induce the experimental conditions. The briefings were as follows:

Information + Control: "This time I'll look only at your dominant hand. Again, I'll slowly increase the pressure. As soon as you feel the pressure has become pain, say stop and I will stop. After that, you mark the scale again".

Information - No control: "This time I'll look only at your dominant hand. Again, I'll slowly increase the pressure. However, there is no point in saying stop this time. I know your pain threshold value is ($x$) from the first measure, so I'll take you up to that value, after which you mark the scale again".

No Information - No Control: "This time I'll only look at your dominant hand. Again, I'll slowly increase the pressure. However, there is no point in saying stop this time. I'm going to take the pressure up to a predetermined value, after which you mark the scale again".

After the briefing, participants in the I+C group simply repeated the baseline trial, halting the trial as soon as they felt the pressure had become painful. Participants in the I-NC and NI-NC groups were subjected to pressure pain stimulus identical to their original PPTs, as determined by their

baseline PPT measures. No participant in the I-NC or NI-NC groups was subjected to pain stimulus greater than that which had been determined by their baseline PPT. All participants then rated their pain using the VASs and compared their second pain experience to their first using the five-point scale.

After the trials were complete, each participant was fully debriefed. The objectives of the study were explained and it was made clear that regardless of any impressions they had formed due to the experimental pre-test briefing, the second stimulus intensity had been identical to their first, and in no case had they been subjected to stimulus intensity greater than that at which they had reported pain threshold at baseline. The manipulation was explained and participants were given the opportunity to comment on the procedure and to discuss their responses to the manipulation.

## Results

One participant in the NI-NC group provided unrealistically high VAS ratings for both the baseline and condition trials. As this rating constituted a statistical outlier, the VAS data from that participant were excluded from analysis.

Table 1 shows the means ($\pm SD$) for baseline and condition PPT and VAS responses and modes for five point scale responses comparing second trial pain level with first trial pain level. As participants were required to compare the second of two identical pain stimuli with the first, a paired sample *t*-test was used to test for a difference between the first and second PPT measures from participants in the control (I+C) condition who had explicit control to halt both trials. No difference was found ($n = 19$; $t = 0.25$; $p = 0.81$), showing that, as for the experimental conditions, participants in the control condition were effectively subjected to the same stimulus intensities for both trials.

Table 1. Means (±SD) baseline and condition PPT values and VAS ratings, and Modes for Likert scale responses comparing the second pain experience against the first, by group.

| CONDITION | Baseline PPT (g) Condition PPT(g) | Baseline VAS (mm) Condition VAS (mm) | Comparison Rating Scale 1 = Much Less, 2 = Less, 3 = The Same, 4 = More, 5 = Much More |
|---|---|---|---|
| | Mean (*SD*) | Mean (*SD*) | Mode (range) |
| Information + Control | 1535 (552) 1523 (576) | 25 (19) 22 (17) | 3 (3) |
| Information No Control | 1510 (557) 1510 (557) | 35 (23) 37 (25) | 4 (3) |
| No Information No Control | 1323 (454) 1323 (454) | 34 (22) 25 (24) | 1 (3) |

Participants were asked to compare their second pain experience with their first using a five point scale (1 = *much less* to 5 = *much more*). The response distributions are shown in Figure 2.
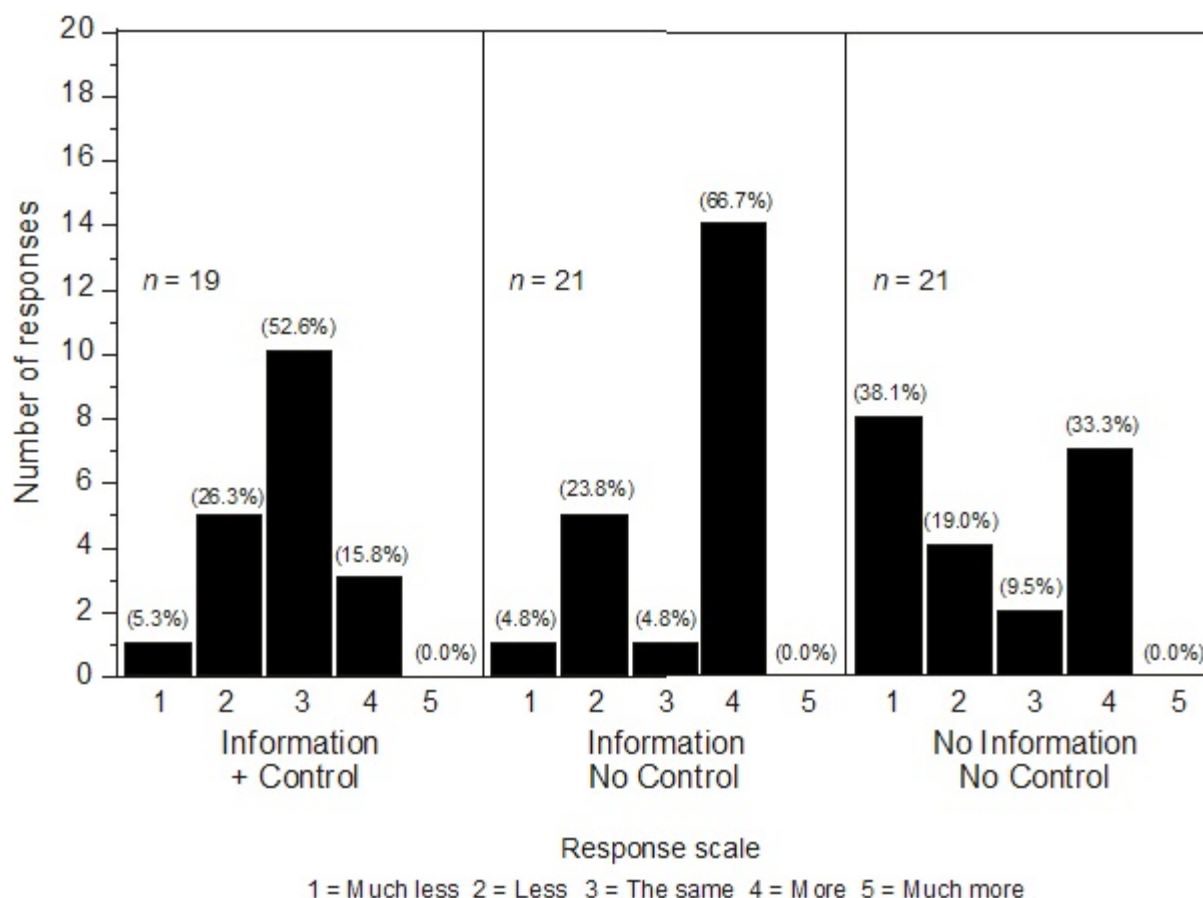


Fig. 2. Distribution of Likert scale ratings comparing the condition-trial pain levels with baseline-trial pain level.

Analysis using Kruskal-Wallis $H$ revealed a significant difference between conditions (see Table 2). Participants in the control group (I+C) rated the second trial the same as the first, while participants in the I-NC group rated the second trial as more painful than the first compared to the control group. Participants in the NI-NC group showed a bimodal response distribution, but the greater proportion (57.1%) rated the second trial as less or much less painful than the first compared to the control group ($\chi^2 = 7.55$, $df = 2$, $p = 0.023$).

Table 2. Mean Ranks of Likert scale responses comparing the second pain experience against the first, by experimental group.

| Condition | Mean rank | $n$ |
|---|---|---|
| Information + Control | 29.03 | 19 |
| Information - No Control | 38.9 | 21 |
| No Information - No Control | 24.88 | 21 |

Whilst there is no correlation between LOC and baseline-trial VAS pain rating for any group, Pearson product-moment correlation showed a significant correlation between LOC and condition-trial VAS pain rating for the NI-NC group ($n = 20$, $r = 0.43$, $p = 0.03$, 1-tailed); a more internal LOC style associated with lower pain ratings, and a more external LOC style associated with higher pain ratings (Figure 3). There was no correlation between LOC and condition-trial VAS pain rating for the I+C group ($n = 19$, $r = 0.03$, $p = 0.46$, 1-tailed), nor for the I-NC group ($n = 21$, $r = 0.06$, $p = 0.40$, 1-tailed).
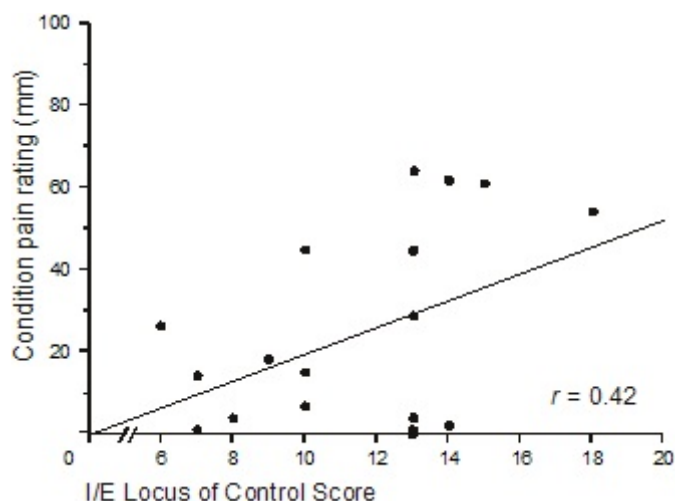


Fig 3. Locus of control score by condition VAS scores for the NI-NC group. Higher values for LOC indicate a more external locus of control.

**Discussion**

The results show that differences in a pre-procedure briefing relating to predictability and locus of perceived control significantly altered participants' perceptions of the second of two identical pain stimuli. Participants presented with both preparatory information and perceived control (I+C) reported no difference in pain sensation between trials, while participants provided with preparatory information but denied perceived control (I-NC) rated the second pain stimulus as being more painful than the first. Participants denied both perceived control and preparatory information (NI-NC) displayed a bimodal response when comparing the second pain stimulus to the first, although a greater proportion of participants (57.1%) reported it as being less or much less painful than reported it as being more painful (33%).

Whilst LOC style and baseline-trial VAS pain ratings are not correlated in any group, LOC style and condition-trial VAS pain ratings are correlated in the NI-NC group; a more internal LOC style associated with lower pain ratings and a more external LOC style associated with higher pain ratings. These correlations may explain the bimodal response distribution of comparison scale responses for the NI-NC group. Although there is no direct correlation between LOC style and comparison scale responses, there is a strong correlation between VAS pain rating and comparison scale responses.

The rating of the second stimulus as more painful compared to the first by participants in the I-NC group supports the suggestion that the provision of information about a potentially painful event can act as a stressor if an individual has no perceived means of influencing that event (Miller & Mangan, 1983; Thompson, 1981; Weisenberg et al., 1985). The absence of a correlation between LOC and condition-trial VAS pain rating for the I-NC group suggest that this effect occurs irrespective of participant's LOC style. Thus, despite LOC and self-efficacy being related (Rokke et al., 1991), it is reasonable to suggest that to engender a sense of self-efficacy sufficient for effective pain coping, it is not sufficient only that an individual has an internal LOC. Also required are the perceived means to influence the situation.

The rating of the second stimulus as less or much less painful than the first by most participants in the NI-NC group also supports the argument that information can act as a stressor. It shows that in a potentially painful situation over which participants were granted no explicit control, withholding preparatory information resulted in the second stimulus being rated as less painful than the first by most participants, compared to the I-NC condition in which preparatory information was given. It is worthy of note that upon debriefing, participants in the NI-NC condition expressed surprise that the second stimulus was identical to the first, and many reported spontaneously that the second stimulus had 'genuinely felt different' (less or more painful according to their experience).

Thompson (1981) noted that due to the diversity in the types of information used, no straightforward relationship has been found between the receipt of information about an event and the reactions to the event. However, Law et al. (1994), found that information in the form of stress inoculation training resulted in higher pain levels for those participants with low desire for and feelings of control. In that study and the study presented here (in which participants were denied explicit means of control), two different types of information; information on dealing with stress and information allowing predictability (respectively), have a similar effect on the perception of pain.

The correlation between LOC and condition-trial VAS pain rating for the NI-NC group suggests that participants who were provided with no information as to the impending stimulus intensity, nor any apparent way to influence it tended to respond to the pain stimulus according to their LOC style. A more internal LOC was associated with lower (though not significantly) VAS pain ratings for the second trial. This result is congruent with the evidence of a relationship between LOC and self-efficacy (Rokke et al., 1991), as it mirrors the result of Weisenberg et als' (1985) study, in which it was found (unexpectedly) that control perceived as being in the hands of the experimenter reduced the reaction to pain in participants with high self-efficacy, but increased the pain reaction in those with a low self-efficacy.

The nature of the effects of perceived control, LOC and preparatory information as shown by this study, suggests that preparatory information about a potentially painful event results in a more negative evaluation of a painful event, irrespective of LOC, when a perceived means of influencing the event is unavailable. However, in the absence of any explicit means of influencing a painful event, withholding preparatory information concerning the event results in a LOC related VAS pain rating and the perception of the second stimulus as being less or much less painful than the first by the majority of the participants.

Whilst the main results of this study show that differences in a pre-procedure briefing can influence significantly the subjective experience of the procedure, further research is needed to illuminate the precise nature of the influences of LOC and self-efficacy on the impact of preparatory information. In the face of correlations between LOC style and condition-trial VAS pain ratings for the NI-NC group, and the general correlation between VAS pain ratings and comparison scale responses, the absence of a significant correlation between LOC style and comparison scale responses is difficult to explain. It is suggested that more specific investigations into the precise nature of the relationship between LOC style and self-efficacy and their influence on the impact of preparatory information on the perception of painful procedures are required. Further, post trial probing would be necessary in order to assess the amount (or changes in level) of control participants felt in response to the manipulation.

The results of this study are relevant to the clinical situation, in which patients are entitled to as much information as is available. As suggested by Miller and Mangan (1983) although the right to information is laudable, it is possible to predict circumstances in which there is a conflict between the rights of the patient to full disclosure of information and the duty of the clinician to minimize patient distress. As shown by the study presented here, the provision of information about an event can exacerbate the experience of an acutely painful stimulus if not presented concomitant with some means of influencing that event. Whilst it would probably benefit patients to ensure that the provision of information was consonant with their coping style, providing information only to those who utilize an information seeking coping strategy (i.e. those who request it), in reality it would not be practical to assess the coping style of every patient about to undergo an acutely painful procedure. Moreover, in cases requiring informed consent from the patient, it is an obvious requisite that all relevant information is presented.

As noted previously, people admitted to hospital or undergoing medical examination tend to adopt the 'patient role' which includes loss of control and a reduction in self-efficacy (Pickering & Friedman, 1991; Pitts, 1993b; Taylor, 1979) and that the adoption of the patient role is often facilitated by the language used by clinical staff (Pitts, 1993a). This study has shown that the use of language in such a way so as to deny, or at least to imply the absence of a perceived means of control, has a significant negative impact on the perception of an acutely painful procedure.

It has been noted that effective pain control often involves altering the cognitive and motivational components of pain (Weisenberg, 1989; 1998). Generating the perception of control may change the patients' perception of an event, from one that is potentially unendurable, to one that is manageable (Thompson, 1981). Further, as previously stated, control does not have to actually be provided, it simply needs to be perceived to be available. It is suggested therefore (as withholding information is out of the question), that promoting the perception of control by encouraging the patient in a participant role could help avoid the conflict predicted by Miller and Mangan (1983). It has been noted that shared control is conducive to the best relations between patients and health care professionals (Skevington, 1995). The results of this study suggest that developing the perception of control within patents would help also in preventing the information that health care professionals are obliged to provide from acting as a further stressor, allowing it instead to be perceived as an empowering component in coping with painful procedures.

**Acknowledgements:**

We are grateful to Dr. Pegg. Chairman of the Ethics Committee for The Royal Free Hospital, London, for agreeing to this project, and to Dr. Áine Burns. Senior Consultant, Renal Transplant Unit, The Royal Free Hospital, London, for her support.

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