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PSYCHOLOGICAL TREATMENT OF EVOKED PAIN AND ANXIETY BY INVASIVE MEDICAL PROCEDURES IN PAEDIATRIC ONCOLOGY

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Over the last decade a great interest in the study of the nature of children's pain has been observed, and relevant advances in this area of knowledge have taken place. Assessment instruments permitting access to subjective experience from a very early age have been elaborated, and beneficial psychological strategies to reduce the distress evoked by invasive medical procedures in childhood cancer have been developed. In this article, a general overview of the nature of pain in relation to developmental issues is presented, and several studies on psychological treatment for children regularly undergoing certain procedures are reviewed. Distraction techniques, the use of imagery and breathing exercises/relaxation training appear to be the essential therapeutic components for relieving pain and reducing anxiety.

Durante la última década se ha observado un gran interés por investigar la naturaleza del dolor infantil, dando lugar a interesantes avances en este campo de conocimiento. Se han elaborado instrumentos de evaluación que permiten acceder a la experiencia subjetiva en edades muy tempranas y se han desarrollado buenas estrategias psicológicas para reducir el malestar evocado por procedimientos médicos dolorosos. En este artículo se ofrece una exposición general sobre la naturaleza del dolor en relación a los aspectos evolutivos y se revisan diversos trabajos relativos al tratamiento psicológico de niños con cáncer que deben someterse con cierta regularidad a tales procedimientos. Las técnicas distractoras, el uso de la imaginación y el entrenamiento en respiración/relajación se perfilan como los elementos terapéuticos esenciales para aliviar el dolor y reducir la ansiedad.

INTRODUCTION AND OBJECTIVES

Observing children's pain and suffering from cancer is undoubtedly a difficult experience for most adults involved in their care: parents, health professionals, etc. Paediatric cancer requires protracted treatment which demands the use of highly aversive medical procedures (Manne, Bakeman, Jacobsen, Gorfinkle, Bernstein and Redd, 1992). Thus, in order to alleviate effects from their pain, children have to endure therapeutic and diagnostic methods which usually evoke painful feelings, even stronger than those caused by the illness irself. Experts in the field all agree that interventions such as lumbar puncture or bone marrow aspiration provoke intense pain which is difficult to control completely. In addition, there are other disturbing situations for patients, especially for younger ones, such as repeated blood extractions, intravenous injections for chemotherapy or re-hydration.

It is considered that feeling pain is an organism's protection mechanism, since it alerts the individual who feels it to something that is going wrong, inducing him/her to start some action oriented to suppressing or decreasing the pain (Guyton, 1992). When an adult person is in this situation, he/she typically undertakes a series of actions aimed at restoring welfare. For instance, taking an analgesic, going to the doctor, resting (stop working). This type of behaviour is called pain behaviour, a much wider category also including verbal behaviour, analgesic manoeuvres, etc., and whose common link is their social significance interpreted by others as signs of pain (Penzo, 1989).

Strictly speaking, the feeling of pain is subjective, since it is not directly or completely accessible to an external observer. Adults are able to communicate and describe their experience to others. They are able to report on the nature of their pain, its location, intensity,

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duration, etc.; these elements are essential for others to know what is happening to them and how to deal with the problem.

In small children, the pain behaviour repertoire is quite limited, since most of these behaviours are acquired in the course of development and during the socialisation process. In general, faced with sharp painful feelings, babies' behaviour seems to be directed at suppressing the painful stimulus (limb movements, torso rigidity, etc.) and at calling for an adult's attention, manifesting their discomfort by crying and screaming. The development of cognitive processes and language acquisition provide infants with rudimentary means of communicating painful feelings to others. But even though they have already acquired the basic capacity to express or recognise the source of pain, they do not have enough autonomy to carry out behaviour oriented to reducing it. Children cannot decide by themselves to go to the doctor, to take a given medicine or not to go to school. As in many other areas of their behaviour, they also depend on adults' decisions in this case. Hence, the importance of the conduct of parents and health professionals.

Until recently, there was a belief that neonates and small children were relatively insensitive to painful stimuli. It was argued that their nervous system was immature or that they did not have memory for pain. Consequently, the use of analgesics was not advised, since they may become addicted more easily than older people, due to the nature of their metabolic process, distinct from that of adults. Several authors (Elliot and Jay, 1987; Bush and Harkins, 1991; Craig and Grenau, 1991; McGrath and Brigham, 1992) share the opinion that this way of thinking has delayed research progress in this field, leading to sanitary practices out of step with current possibilities. As McGrath and Unruh (1987) argue, it is relatively simple to infer that children do not experience pain in certain medical interventions, when they are not usually asked whether they are feeling pain or not. Smaller children hardly know how to express painful feelings. They are impeded from executing pain behaviour, and they cannot manifest disagreement or oppose tests. Although the situation has considerably changed in the last decade, there is still some reluctance to prescribe analgesics in a similar proportion to adults in similar circumstances.

At present, research is conclusive with respect to neonates (and even those born prematurely) being sensitive to tissue pain-causing stimuli, which they react to with a well co-ordinated pattern of responses (oral, motor or physiological), unmistakably representative of pain (Craig and Grunau, 1991; Johnston, Stevens, Craig and Grunau, 1993; McIntosh, Van Veen and Brameyer, 1993, among others). As a general guideline, the baby confronted with the sudden onset of a painful stimulus responds with a strong scream, followed by tears, grimaces, leg shaking and rigidity and body movements including kicking, clenching of fists and torso rigidity. At the same time, physiological changes in heart rate, breath rate and oxygen and carbonic anhydride concentration in blood, as well as metabolic and endocrine disorders have been evaluated (Craig and Grunau, 1991).

Around six months of age, babies already show anticipatory fear reactions in the face of certain painful events (for example, injections), and may initiate rudimentary instrumental behaviour oriented to defend themselves from, or avoid, the event. This capacity to anticipate pain clearly marks the emergence of learning and memory. During the second year of life, duration of screaming and tears decreases, the child visually searches for her/his mother and the nurse before the injection, concentrates his/her attention on the injection point and tries to protect him/herself with the arms or hands; moreover, he/she is already able to verbally communicate (Craig and Grunau, 1991).

The ability to spontaneously communicate painful feelings (when hurt in some way) progresses as the child grows and improves his/her verbal repertoire. They gradually learn to distinguish and describe where and how much it hurts, using the same terms they have learned for expressing the size and quantity of physical objects (a little, slightly, much). Between 5 and 7 years old, most children can clearly discriminate pain intensity, and it is possible to use quantitative scales to assess subjective feelings (McGrath and Brigham, 1992). Although they are able to localise pain in a given part of the body, they usually think that both pain and illness are caused by external and specific reasons; they think that they are "contaminated" by having touched somebody, eaten too much or done something dangerous (Manne and Andersen, 1991). In these age ranges, some children may perceive their illness and certain medical tests as a punishment for doing something naughty. Until around nine, they do not clearly understand that pain may be generated by an illness, the malfunction of some organ or the presence of certain germs (Gedaly-Duff, 1991).

The adolescent period is marked by maturity in cognitive functioning and important physical and physiological changes, as well as crucial changes in social and

family interactions. Children at this age perfectly understand that illness is located inside the body, and that its causes may be internal as well as external (McGrath and Pisterman, 1991). Some research indicates that adolescents conceive cancer as an illness from which it is difficult to recover, in comparison with heart diseases, diabetes or mental problems (Manne and Andersen, 1991). The psychological impact of cancer in such a developmental moment may be more problematic than at any other period. Illness and its treatment impair social relations, as well as the development of an adequate self-image (Die Trill, 1987). Fear of the negative effects of treatment leads some adolescents to reject it or end it prematurely, directly affecting the probability of relapses and endangering their own survival (Varni and Katz, 1988).

In summary, children's pain requires a special way of addressing the problem, in which knowledge and comprehension of developmental aspects is of great relevance. From birth, the child is subjected to continuous physical and psychological changes determining its way of facing pain, comprehending it, and communicating it to others. In recent years there has been a great effort to investigate the peculiarities of pain experience at different ages. Many fine-tuned instruments for assessment have been devised, and several psychological strategies oriented to alleviate pain and discomfort caused by invasive medical procedures have been developed. Specifically, the central goal of our work is to offer a general, panoramic view of therapeutic techniques used in children with cancer. Thus, we have made a review which, while not pretending to be exhaustive, illustrates research published in the last few years.

THE NATURE OF PAIN IN PAEDIATRIC ONCOLOGY

There is a wide agreement on considering pain as an integrated pattern of observable, hidden and physiological responses which can be stimulated by tissue damage and provoked or maintained by other antecedent and consequent conditions (Bush and Harkins, 1991). In the context of pain associated with invasive procedures, some authors (e.g. Broome, Bates, Lillis and McGahee, 1994) prefer to adopt the definition suggested by the International Subcommittee for the Study of Pain, which describes it as a sensorially and emotionally unpleasant experience associated with actual or potential tissue damage (Merskey, 1979, quoted in Broome, Bates, et al., 1994).

In child oncology, pain caused by *illness* itself and that generated by *diagnosis or medical treatment* are usually distinguished (Jay, Elliott and Varni, 1986). The first type has its origin in the invasion by the tumour of bones, nerves, muscles or other organs, with bone affection being the most common cause of pain (Bonica, 1980). An important percentage of children with leukaemia (between 12 and 52%), the most frequent type of cancer in childhood, suffer from bone pain. The second type of pain is a direct consequence of diverse therapeutic or diagnostic methods, for instance: post-surgical pain provoked by damage to nerve ends during surgery; pain after radiotherapy -caused by fibrosis or damage to connective tissues surrounding the irradiated zone; or pain produced by lumbar puncture or bone marrow aspiration.

Clinical observation suggests that smaller children usually react with more severe discomfort during medical procedures acting on the body surface than to internal injuries related to the course of an illness (Jay, Elliot, Katz and Siegel, 1987).

Starting from temporal criteria -although other differentiating features may exist- a distinction is made between *sharp pain* and *recurrent pain* (Bush and Harkins, 1991; McGrath and Brigham, 1992).

Sharp pain is evoked by a well-identified noxious stimulus, it is of short duration and has a notable functional value, since it operates as a sign to initiate restoring or protective behaviour. Generally, pain fades as damage is repaired, so that the physical and emotional discomfort does not last for very long. Sharp pain evoked by tissue damage (falls, burns and cuts, etc.) constitutes the most frequent painful experience during childhood and adolescence. Every child also experiences sharp pain due to common illness or dental intervention.

The term *chronic pain* is used to refer to a long-term painful experience, usually associated with prolonged illnesses such as cancer or child rheumatoid arthritis. It does not completely cease with treatment and it has no adaptive value. The psychological impact of chronic pain is greater than that of sharp pain, and appears associated with sensorial, environmental and emotional factors.

Some authors hold that children are more likely than adults to experience *recurrent pain*, which shares some of the aspects of sharp and chronic pain. It is characterised by the presence of repeated painful episodes which, although of short duration, may persist throughout childhood, and usually have multiple causes (McGrath and Brigham, 1992). Pain evoked by medical procedures

(for example, repeated marrow aspiration), painful episodes associated with the course of an illness, and pain of ambiguous aetiology (e.g. recurrent abdominal pain or head-aches) are included in this category.

In contrast with the most common types of cancer in adults (stomach, lung, colon and rectum -Ely, Giesler and Moore, 1991), which usually produce severe and protracted pain, childhood cancer rarely produces chronic pain (Varni and Katz, 1988). The most frequent causes of sharp pain and discomfort in children with cancer are related to medical procedures for diagnosis and treatment, in particular, *marrow aspiration and lumbar puncture* (Jay et al, 1986; Varni and Katz, 1988). However, both methods are routinely used in cases of leukaemia, since they are indispensable in determining the course of the disease and the treatment to be applied.

Researchers, parents and children coincide in considering that marrow aspiration is a highly aversive, traumatic and painful procedure (Jay and colleagues, 1986, 1987). Many children, especially adolescents, say that enduring this process is worse than having the illness. This fact puts the acceptance of treatment and the correct follow-up of medical prescriptions (adherence) in jeopardy, with a subsequent risk to the patient's improvement (Kuttner, 1989).

In short, bone marrow aspiration consists in the insertion of a long needle into the hip bone (posterior italic crest) and the sucking out (aspiration) of a portion of the marrow, with a syringe, in order to obtain a sample and analyse it to detect the presence or absence of cancer cells. Most patients describe three sources of pain during the process: a) a sharp, acute pain when the needle enters into the skin, b) a sharp pain and strong pressure when the needle enters the bone (periosteum), and c) an intense and very sharp pain when the marrow is aspirated with the syringe (Hilgard and Le-Baron, 1984; Jay et al., 1987). Although the test is usually carried out under the effect of local anaesthetics or tranquillisers, none of these are totally unproblematic. Local anaesthesia (usually a Lidocaine injection) is only partially effective, since it fails to eliminate the intense pain caused by aspiration. Tranquillisers have paradoxical or side-effects, especially in smaller children, and are administered with caution. General anaesthesia, used in some European countries, also has its risks, and makes the intervention much more expensive, so that it is not a widespread practice (Jay et al., 1987; Kuttner, Bowman and Teasdale, 1988).

Lumbar puncture is similar to marrow aspiration in that it is a recurrent source of pain for children with cancer. In this case, a narrow needle is inserted between the fourth and fifth lumbar vertebra to penetrate into the sub-arachnid space. The aim of the puncture is usually to take a sample of cerebro-spinal fluid or to inject some medicine (intratecal medication) that is part of chemotherapy treatment. Children must adopt a foetal posture, with their chin tucked into their breast, and lie on one side, so that the back is accessible (Hilgard and LeBaron (1984). As in marrow aspiration, local anaesthetics and tranquillisers are used.

Anxiety reactions during the execution of the test and the fear of having to repeat it in the future (anticipatory anxiety) is a phenomenon common to both procedures. At least two works (Zeltzer and LeBaron, 1982; Bradlyn, Harris, Ritchey, et al., 1993) have experimentally verified that marrow aspiration is a more aversive method than lumbar puncture. In the first study, children reported that the pain felt during aspiration (rated on a 1 to 5 scale) was significantly greater than that perceived during lumbar puncture; however, significant differences between the two methods were not found with respect to the degree of anxiety. On the other hand, Bradlyn and colleagues also confirmed that children showed greater verbal and behavioural discomfort with marrow aspiration than with lumbar puncture (means: 5.26 versus 3.86 / 1.5 versus 0.72, respectively, in each behavioural category).

The greatest inconvenience for healthcare professionals is probably the speed with which most children at any age develop conditioned anxiety responses to these procedures and the objects associated with them. As a result of this, some children suffer from phobia of needles, problems with eating and sleep disorders (Kuttner, Bowman and Teasdale, 1988). In the immediacy of a marrow aspiration, smaller children usually react by screaming, or presenting verbal and physical opposition, obstructing the work of doctors and nurses. These manifestations provoke considerable stress in personnel and parents since, on many occasions, it is necessary to repeat the puncture or injection, making the process even more painful. In addition, there is enough evidence to indicate that children do not appear to become accustomed to the situation with its repetition. In the absence of psychological intervention, it may take two or three years before they learn to cooperate (Jay, 1988). Curiously, in Bradlyn and colleagues' previously-mentioned work (1993), a negative correlation (-0.60 and -0.49) was found between verbal distress (lamentations,

comments about the pain or damage, asking to stop the test, etc. ...) and previous experience (marrow aspiration and lumbar puncture, respectively), but manifestations of behavioural discomfort (body movements, muscular rigidity, back bending, etc.) show no relation with previous experience.

Another important source of child distress is related to intravenous chemotherapy administration and its side-effects, particularly nausea and vomiting. Injections appear to affect children more than adolescents. Manne, Redd, Jacobsen, Gorfinkle, Schorr and Rapkins (1990) remark that some patients receive more than 300 vein punctures in the course of treatment, and that approximately one third of the younger patients (3-9 years) have to be held tightly by the parents or the nurse before the needle can be inserted. Dolgin, Katz, Zeltzer and Landsverk (1989) verify that adolescents manifest more symptoms of discomfort than children, before and after chemotherapy, in nearly every variable investigated: anxiety, changes of mood, activity level, appetite loss, sleep disorders, somatic complains, resistance to treatment (verbal or physical) and nausea and vomiting. They also observed that discomfort tended to decrease and stabilise during treatment in children, whilst it increased in adolescents.

Perhaps because of these difficulties, researchers have focused their attention on the search for psychological techniques oriented to controlling pain and discomfort associated with cancer diagnosis and treatment, whilst research on chronic pain related to the course of the illness is much more limited.

The concept of distress

In very aversive situations causing sharp pain, such as those we have been discussing, it is practically impossible to distinguish anxiety or fear produced by a certain medical procedure from pain; they both form part of the child's experience (Ruth and Sanfilippo, 1991). Such a distinction becomes even more difficult in the case of smaller children. Similarly, it is complicated to separate negative reactions associated with pain from emotions evoked by hospitalisation, illness, separation from parents or physical immobility (Bush and Harkins, 1991).

The term "distress" is used to describe discomfort reactions (to pain or to anxiety) in invasive medical procedures. This concept has been widely accepted in the specialised literature and has been used since the works of Katz, Kellerman and Siegel (1980).

EPIDEMIOLOGICAL DATA

Fortunately, paediatric cancer is rare, although in developed countries it is the second most common cause of death in childhood after the first year of life (Martos and Olsen, 1993). Childhood cancer mainly affects the haematological system, the central nervous system and the embryonic or connective tissues (Manne and Andersen, 1991).

In the decade between January, 1st, 1980 and December, 31st, 1989, a total of 5.094 cancer patients were registered in Spain, with ages from 0 to 15 years old. 2.930 were males and 2.164 females, in a 1.35 males to females proportion (Zubiri, Cuchí and Abadía, 1991). The incidence of cases is greater in the first five years of life, probably because this period coincides with leukaemia diagnosis (especially with acute lymphocytic leukaemia), whose modal incidence is situated at age 4 (Manne and Andersen, 1991). Leukaemia, tumours of the central nervous system, lymphomas, neuromas and nephromas make up the largest percentage of cancer in Spanish children (Del Pozo and Polaino, 1993), a very similar trend to that observed in other countries (see Table 1).

Table 1
Comparative incidence of children's cancer*

Type	Manchester	Japan	Australia	Sweden	United States	
					Whites	Blacks
Leukaemia and lymphoma						
Acute lymphocytic leukaemia	25,9	12,5	31,7	29,1	24,6	12,9
Acute myeloid leukaemia	4,9	13,3	2,7	5,0	6,6	3,9
Other leukaemias	1,9	5,5	1,4	5,2	10,9	7,3
Non-Hodgkin's lymphomas	4,6	3,8	7,2	8,5	6,3	6,4
Hodgkin's disease	3,7	0,5	6,2	3,2	5,8	6,0
Total % of tumours	41,4	47,4	43,6	37,1	44,4	39,1
C.N.S. Tumours						
Astrocytoma	8,9	1,1	9,5	14,3	8,2	8,2
Medulloblastoma	5,0	0,9	4,7	4,7	4,8	2,1
Ependymona	8,8	0,5	2,5	4,3	1,3	1,3
Others	6,3	8,9	5,7	9,3	9,8	12,0
Total % of tumours	23,0	14,8	19,8	24,3	19,2	24,4
Tumours of the connective tissues						
Rhabdomyosarcoma	3,7	1,4	3,5	1,1	4,5	1,3
Other soft tissue sarcomas	0,5	0,0	0,2	2,6	3,0	2,6
Fiberdarcoma	0,7	0,3	0,2	1,2	0,9	0,0
Osteosarcoma	2,5	0,6	1,0	3,1	3,3	4,3
Ewing's Tumour	2,0	0,3	3,5	1,6	1,7	0,0
Total % of tumours9,8	2,9	7,7	6,8	10,8	8,9	
Embryonic Tumours						
Wilm's Tumour	5,1	3,7	7,2	8,4	7,6	7,7
Neuroblastoma	6,2	7,3	8,7	6,5	9,4	6,9
Retinoblastoma	2,9	5,0	5,0	4,1	3,4	3,0
Other tumours	11,3	11,5	11,9	19,9	12,5	10,6
Total % of tumours	25,7	35,0	28,9	31,7	25,6	27,6

Source: BIRCH (1983)
* Figures correspond to gross rate per million inhabitants

In EC countries and in the period 1979-1988, five children out of 100,000 died as a result of cancer, which amounts to approximately 3,400 deaths per year (Martos and Olsen, 1993). Leukaemia was the most common cause (39%) of death from cancer, followed by brain and central nervous system tumours (22%) and bone tumours (9%) - see Table 2. The most lethal tumours in the Spanish child population are, in decreasing order: hepatoblastomas (62,8%), bone tumours (50.9%), neuromas (49.4%), rhabdomyosarcomas (45.7%) and leukaemia (44%) (Zubiri, Cuchí and Abadía, 1991). However, according to these authors' analysis, the encouraging data is that circa 60% of children with cancer survive beyond 8 years.

Continuing with Martos and Olsen's work (1993), it is noticeable that Southern European countries (Greece, Italy, Spain, Portugal and France) had higher death rates than Central and Northern European countries. Taken as a whole, the male death rate exceeded by 28% that of females, with a range oscillating between 17% in Ireland and 36% in Spain. In terms of age, and considering both sexes, the highest death rate is observed between 5 and 9 years of age (Table 3).

ASSESSMENT AND TREATMENT OF CHILD DISTRESS IN ONCOLOGY

In order to address these aspects (assessment and treatment), we analysed a total of 19 studies related to cognitive-behavioural treatment of distress evoked by aversive medical procedures, published between 1982 and 1994. Their most relevant characteristics are described in Appendices 1 and 2. The data contained in them come from the direct analysis of 14 original works and 5 studies reviewed by other authors (identified in Appendix 1); they are included here because they provide relevant information on the topic.

Table 2
Annual deaths and children's death rate (yearly average) in European Community, 1979-1988.

Types	Deaths/year		Death rate	
	Number	%	Male	Female
Leukaemia	1.327	39	22	16.6
Brain and Nervous System.	748	22	11.9	9.9
Lymphoma	243	7	11.9	9.9
Kidney	126	4	1.9	2
Bones and soft tissues	301	9	4.4	4
Others	423	12	7.2	5.8

Source: Martos and Olsen (1993, p. 1786)

Medical procedures selected are: marrow aspiration, lumbar puncture, chemotherapy and injections. As previously indicated, they all evoke a certain degree of pain and behavioural distress, they must be repeated several times in the course of treatment and they require co-operation by the child during the process. The age range of participants in this work covers from 3 to 20 years, with a higher percentage of males than females. According to epidemiological data, most of them were diagnosed with leukaemia or lymphoma (see Appendix 1).

Research interest in these topics seems to be motivated by the need to find strategies alternative to purely pharmacological ones, which could permit the alleviation of undesirable effects of the diagnosis and treatment of disease. The alleviation of childhood distress brings important benefits for everyone involved in the process; for example, it is quite likely that the child's and the family's quality of life will improve when sources of stress are reduced; if the child learns to collaborate with, instead of opposing, sanitary personnel, and if these personnel know how to act, the process will be less painful for the child and less stressful for the professionals involved.

Assessment methods

Assessment has been oriented to obtaining quantitative measures of the dependent variable: "pain intensity", "degree of anxiety", "severity or frequency of nausea and vomiting", as well as "presence and intensity of behaviours indicating discomfort". The methods most commonly used in the works revised are self-report and behavioural observation (see Appendix 2).

The *self-report* model preferred by researchers was "evaluation or classification scales", including: thermometer or Likert-type numeric scales, analogical-visual scales and face-scales. They are all quantitative scales

Table 3
Death rate (x 10^6) from paediatric cancer in European Community (1979-1988): sex and age.

Type	Boys			Girls		
	0-4	5-9	10-14	0-4	5-9	10-14
Leukaemia	19,1	26,0	21,4	16,0	18,4	15,3
Brain and Nervous System.	12,4	13,1	10,2	10,3	11,2	7,6
Lymphoma	3,8	5,9	4,9	2,2	1,9	2,1
Kidney	3,0	1,9	0,6	2,8	2,3	0,7
Bones and soft tissues	2,8	4,0	6,6	2,9	3,0	6,3
Others	11,4	5,4	4,1	9,4	4,5	3,1

Source: Martos and Olsen (1993, p. 1786)

where the child must choose the point on the scale which best expresses intensity or amount of pain, fear, etc. (McGrath and Brigham, 1992). They have the advantage of being very simple to apply and of allowing access, in an objective way, to the subjective experience of the child.

Typical *Likert-type scales* are comprised of 5 points or levels usually associated with words denoting the increase in discomfort for each level: none, a little, medium, quite a lot, and a lot (for instance, in the work of Zeltzer and LeBaron, 1982).

The *pain thermometer* is a scale of the same type as the Likert, represented by a picture of a thermometer, usually numbered from 0 to 10 (or 0 to 100), where zero represents "absence of pain" and 10 "the worst pain possible" (Jay et al., 1987). The child marks or fills up with colour to a certain level on the mercury bar in order to indicate the intensity of pain (as in Dahlquist, Gil, Armstrong, Ginsberg, and Jones, 1985).

Analogical-visual scales (AVS) have been used, most of all, to measure severity of nausea and vomiting following chemotherapy. They consist of lines, 10cm long, at either end of which is marked "no nausea" and "the worst nausea". The child marks along the line the intensity of nausea. Score is obtained by measuring in millimetres the distance from the left end (corresponding to minimum) to the mark (Redd, Jacobsen, Die Trill, Dermatis, McEvoy and Holland, 1987).

Face-scales are drawings or pictures of faces with different pain expressions which vary according to the intensity intended to be represented. Children must select the face which best corresponds to the amount of pain experienced during the procedure under study. This type of self-report is the most advisable one for smaller children. CAPS (Children's Anxiety and Pain Scales) - used in Kuttner, Bowman and Teasdale (1988)- in particular allow the evaluation of pain and anxiety in an independent way.

Observation of Behaviour measures focus on registering in a concise way how the child behaves in situations causing pain or anxiety (distress). We used the following in our review:

Procedure Behavior Rating Scale (PBRS-R) (Katz, Kellerman and Siegel, 1980)
This scale is comprised of 11 behaviours indicating distress (tears, screams, muscular rigidity, physical or verbal resistance, demands for emotional support, etc.). Observers register the presence of these behaviours at three specific moments in time during marrow aspiration or lumbar puncture. The degree of discomfort is determined by the total number of behaviours registered. Starting from this scale, the following two were elaborated.

Observation Scale of Behavioral Distress (OSBD) (Jay, Ozolins, Elliott and Caldwell, 1983)
This scale lists the same behaviours as the previous one, with the difference that it uses an interval registration (every 15 seconds) throughout the duration of the procedure. Each behaviour has a relative value assigned to its weighted intensity which varies in a 1 to 4 range, where 4 represents the highest degree of distress. Thus, the scale allows us to obtain a score on intensity.

Procedure Behavior Checklist (PBCL) (LeBaron and Zeltzer, 1984 b)
This contains a total of 8 behaviours similar to those on the previous scales. The observer rates their intensity on a 1 to 5-point scale.

The three previous scales are more appropriate for children between 6 and 10 than for any other age range (McGrath and Brigham, 1992). The first two have better reliability and validity than the third.

Child-Adult Medical Procedure Interaction Scale (CAMPIS) (Blount, Corbin, Sturges, Wolfe, Prater and James, 1989)
This is a more recently-developed scale, devised to evaluate the interaction between child and significant adults (parents and sanitary personnel) during the practice of a particular medical test. It aims to study adults' verbal behaviour, and how it affects (increasing it or diminishing it) the child's distress during the process. The scale contains 32 categories which allow the codification of comments made by adults among themselves, adults to the child, and the child alone. The child's verbalisation coding covers *manifestations indicating distress* (tears, screaming, verbal resistance, verbal expressions of pain or fear, etc.), *normal conversation* (information about child's state, demands for consolation not related to the procedure, assertive expressions, etc.) and *coping behaviour* (clearly perceptible deep breaths, words for facing up to the situation). The coding is made through the transcription of the recording made during the session.

Three studies (Jay and colleagues, 1987; 1991; Redd et al., 1987) also used physiological measures, heart rate and blood pressure. Several studies (see Appendix 1 and 2)

complete the evaluation task with questionnaires or through reports, obtained from parents and sanitary personnel, about the degree of distress observed in the child, using a Likert-type scale.

The methods described are a quite representative sample of advances achieved in matters of children's oncological pain assessment. However, our list of methods and instruments available for the assessment of pain in this and other medical contexts is in no way exhaustive. Detailed descriptions may be consulted in reviews by McGrath and Brigham (1992) and Karoly (1991), and a simple enumeration in table 4. For our part, we should mention the *Douleur Enfant Gustav-Roussy Scale (DEGRS)* - Gustav-Roussy's Child Pain Scale- de Gauvain-Piquard, Rodary, Redvani and Lemerle, 1987), since it is so far the only scale available for detecting the presence and intensity of prolonged pain related to the course of illness in smaller children (2-6 years old). It has a total of 17 items, of which 7 behaviours indicate pain (for example, pointing to on protecting the painful area), 6 indicate depression (e.g. isolation, lack of interest in things going on around, etc.) and the remaining 4 reflect anxiety (irritability, changes of mood). The original scale had some defects, but the revised version has apparently satisfactorily overcome them (McGrath and Brigham, 1992).

Table 4
Other measures of child pain and distress assessment

INTERVIEWS	- Pediatric Pain Questionnaire (Tesler et al, 1983) - Varni/Thompson Pediatric Pain Questionnaire (Varni, Thompson and Hanson, 1987) - Children's Comprehensive Pain Questionnaire (McGrath, 1990)
SELF-REPORTS	- Poker Chip Scale (Hester, 1979) - Children's Global Rating Scale (Carpenter, 1990) - Face Scales: - Facial Affective Scale (McGrath, De Veber and Hearn, 1985) - Faces Pain Scale (Bieri et al, 1990) - Oucher Scale (Beyer, 1984)
BEHAVIOURAL OBSERVATION	- Infant Pain Behavior Rating Scale (Craig et al, 1984) - Children's Hospital of Eastern Ontario Pain Scale (McGrath, Johnson, Goodman et al, 1985) - Postoperative Comfort Score (Attia et al, 1987) - Pain Discomfort Scale (Broadman et al, 1987) - Douleur enfant Gustave-Roussy Scale (Gauvain-Piquard, Rodary, Rezvani and Lemerle, 1987)
PHYSIOLOGICAL	- Heart rate - Breathing rate - Palm transpiration - Cortisol and Cortisone levels - Transcutaneous oxygen pressure - Vagal Tone - Endorphin concentration
PROJECTIVE METHODS	- Eland Color Tool (Eland, 1982) - Pediatric Pain Inventory (Lollar, Smits and Paterson, 1982)

Source: McGrath and Brigham (1992, pp. 301-308)

Finally, when choosing among methods of assessment, the researcher or professional must take into account subject's age. Although it would be ideal for the child to report his/her own discomfort, this is impossible with babies and small children, so that it is necessary to appeal to other methods allowing inference of the subjective degree of discomfort. McGrath and colleagues (1990, 1992) suggest that physiological measures of distress are fundamental at very early ages (0-3). From 3-5 years onwards, most of the authors recommend the use of self-report methods in conjunction with behavioural observation and physiological measures (see Table 5).

Treatment

Considering the data from Appendix 1 as a whole, it may be concluded that distraction, imagery, and relaxation/respiration exercises are the essential therapeutic methods in attempts to alleviate child discomfort evoked by invasive medical procedures. All the studies have used treatment techniques in which some or all of these basic elements are present. However, some difference can be observed between the first studies, focusing on checking the effectiveness of hypnotic suggestion, and the studies published since 1985, which used wider "treatment sets" combining various cognitive-behavioural strategies.

One aspect to be highlighted with respect to the three elements mentioned is the difficulty of establishing clear distinctions among them, since their limits become confused and blurred in the context of clinical application. For example, the way children are instructed to use respiration exercises also involves a certain degree of distraction and imagery. In a similar way, imagery techniques such as emotive imagery or hypnotic suggestion

Table 5
Pain assessment methods according to age

Age	Behavioural Measures	Physiological Measures	Self-Report
0-3	Very few specialised scales available	First degree of of importance	Not adequate
3-6	First importance. Specialised scales available	First importance if there are no behavioural observation scales	Important Source
+ 6	Important source	Important source	Main source

Source: McGrath and cols (1990), in Manne and Andersen (1991, p.357)

involve an element of distraction. The following paragraph, used by Jay, Elliot, Ozolins, Olson and Pruit (1985) with five children aged 3.6 to 7 years during respiration training illustrates this:

"Pretend you are a big, round tyre. Breathe deeply and fill the tyre up with as much air as you can. Then, let the air out slowly, making a whistling sound as the air goes out of the tyre" (p.515)

Distraction

The primary objective in this cognitive technique consists in diverting attention away from the painful zone in order to direct it and focus it on another type of stimulation. As McGrath (1991) points out, distraction is not a passive strategy oriented to amuse the child, but a way of focusing attention on a type of task which allows the active alteration of the sensorial perception of pain. The more absorbing the chosen activity, and the more the child concentrates on it, the more likely it is to reduce the painful feeling. It is assumed that distraction works because it attenuates neuronal pulses evoked by the painful stimulus (McGrath, 1991), or because it interrupts the emotional procedure of painful feeling, diminishing the intensity of discomfort (Kuttner, 1989).

A key aspect for making distraction efficient is to get the child to keep his/her attention on the task while the procedure is being carried out, so that distractors selected by therapists must meet some requirements, such as novelty, variety, a certain degree of difficulty and the ability to evoke curiosity in the child.

In the revised studies, distracting techniques include external distractors, such as video-games (Kolko and Rickard-Figueroa, 1985; Redd et al., 1987), telling jokes and playing riddles (Zeltzer, LeBaron and Zeltzer, 1984), or looking at 3D picture books (Kuttner, Bowman and Teasdale, 1988), and internal distractors, such as emotive images (Jay et al., 1987, 1991).

Two studies (Kolko and Rickard-Figueroa, 1985 and Redd et al., 1987) have shown the effectiveness of distraction (video-games) for decreasing anticipatory symptoms and discomfort associated with chemotherapy. Kola and Rickard-Figueroa's study was made with three children of 11, 16 and 17 years old. A multiple alternating (ABAB) inter-subjects baseline design was developed over 13 chemotherapy sessions, where A represents baseline records and B stands for video-game use (treatment condition) during intravenous administration of chemotherapy. Results indicated that symptoms decreased as a consequence of experimental treatment, both in subjective reports and in behaviour observed.

Redd and colleagues (1987) confirmed these findings by showing that the use of video-games during chemotherapy sessions significantly reduced anticipatory nausea and, to a lesser extent, anxiety. These authors made two studies: in the first, 26 subjects (9-20 years old) participated and were alternatively assigned to two conditions, *experimental*, where subjects chose a video-game among 25 available, and *control*; subjects assigned to the latter group were allowed to play with toys, read books or watch TV, but no attempt was made to change their behaviour. Results showed significant differences between the two conditions; in the experimental group, severity of anticipatory nausea (self-evaluated) was considerably reduced with respect to baseline levels, while changes were hardly observed in the control group (32.23 to 15.32 versus 30.85 to 25.09; pre and post-treatment measures respectively). In the second study, 15 subjects participated and an ABAB design was developed during the course of a chemotherapy session. Subjects evaluated severity and degree of anxiety; heart rate and blood pressure were also registered. Results were consistent with the first study: nausea decreased as a function of the use of video-games. Anxiety showed a tendency to decrease as a consequence of presence or removal of treatment, but differences did not reach the statistical significance level. Only systolic blood pressure was significantly affected by treatment.

Authors consider that the fact that treatment did not affect physiological variables supports the hypothesis that cognitive and behavioural distraction is the only mechanism responsible for the success of the procedure and, hence, that reduction of conditioned nausea may be achieved by distracting tasks, without the need for a physiological relaxation.

The effectiveness of distraction is also endorsed by the work of Manne, Bakeman, Jacobsen, Gorfinkle, Bernstein and Redd (1992), who investigated the influence of adults' behaviour in childhood distress evoked by intravenous injections made during cancer treatment. Results showed that the attempts to distract the child's attention during the situation was the only adult behaviour that had beneficial effects on children's coping and distress. The use of distracting strategies significantly enhanced the probability that the child initiated coping behaviour, and reduced discomfort and crying behaviour.

Imagery-Hypnosis

The use of imagery with therapeutic goals is widely documented in the literature on anxiety problems. In the context of paediatric oncology several strategies have been used which share this element: hypnosis (for example, Zeltzer, LeBaron and Zeltzer, 1984), emotive imagery (Jay and colleagues, 1985, 1987, 1991) or guided imagery (McGrath and De Veber, 1986) - see Appendix 1. The main objective of all of them is to get the child to concentrate intensively on mental images representing a given experience or situation, usually suggested by the therapist. It is necessary that the image be as vivid as possible, so that it also evokes feelings and emotions associated with the imagined experience (McGrath, 1991).

Hypnosis constitutes a magnificent example of imagery use for reducing pain associated with invasive medical procedures. It can be defined as an alternative state of consciousness which often, though not always, implies relaxation, and in which an individual reaches a high degree of concentration that enables him/her to accept suggestions to use coping strategies in an optimal way (Kuttner, 1989). Hilgard and LeBaron (1984) describe two methods for inducing a hypnotic state in children. The first consists in focusing their attention on a "visual objective", for example, a "funny face" drawn on a thumbnail with a red pencil, while trying to relax the body and concentrate on what the therapist says. In the second method, the child is encouraged to fully immerse him/herself in some imaginary story or fantasy. The choice of one or the other depends on the child's age, capacity and interest, though it is more frequent to encourage him/her to imagine a pleasant experience. A good indicator of hypnotic suggestibility is the child's ability to get involved by him/herself in games requiring the taking on of a given role. The final objective is that the child becomes so involved in and absorbed by these images that he/she allows a partial dissociation of the painful situation, which helps to make the pain more bearable (Kuttner, 1989).

In general, results obtained with this technique indicate that hypnosis is a useful method for alleviating child distress associated with cancer assessment and treatment (see Appendix 1). Several studies show that hypnosis is efficient for reducing nausea and vomiting following chemotherapy administration (Zeltzer, Kellerman, Ellenberg and Dash, 1983; Zeltzer, LeBaron and Zeltzer, 1984; LeBaron and Zeltzer, 1982, Zeltzer and LeBaron, 1982; Katz, Kellerman and Ellenberg, 1987; Kuttner, Bowman and Teasdale, 1988).

Eight 14-year-old adolescents (mean) accepted to participate in the Zeltzer et al (1983) study, which had an AB design. The frequency of post-chemotherapy vomiting was reduced in all cases by 53% with respect to baseline self-reports, while its duration only decreased by 44%. Similar results were obtained by LeBaron and Zeltzer (1984a) with 8 subjects between 10 and 18, and with a multiple baseline design.

Zeltzer, LeBaron and Zeltzer (1984) partially confirmed previous results by comparing a hypnosis treatment group with a "psychological support" group, in which deep breathing and distraction (attending to different objects in the treatment room, telling jokes, riddles, etc.) were used, attempting to avoid the use of imagery or fantasy in the process.

Treatment with hypnosis, meanwhile, was centred on just this aspect: to help the child to get involved in imagery and fantasy as much as possible; in addition, hypnotic suggestions were applied so that they would use imagery at home, and so that they would eat and sleep well. A total of 19 children, with ages between 6 and 17, participated in the study. Subjects were randomly assigned to each condition, although they were matched for age and pharmacological agents used in chemotherapy, in order to avoid potential bias. Both types of intervention proved to be effective in reducing the assessed symptoms: severity and intensity of nausea and vomiting, and degree of discomfort caused by them. However, no significant differences were found between them.

With a practically identical design, Zeltzer and LeBaron (1982) investigated the effectiveness of hypnosis for reducing pain and anxiety evoked during lumbar puncture and bone marrow aspiration. Thirty-three children (aged 6 to 17) were assigned to two methods of treatment: hypnosis (fantasy induction) and non-hypnosis (distraction, deep breathing and exercise sessions). Mean pain and anxiety intensity was estimated from the assessment made by children and observers on a 1 to 5-point scale. Results showed that, during aspiration, both treatments significantly reduced the pain, though hypnosis provided better results, since it reduced pain to a greater extent than the non-hypnosis treatment (1.5 vs 0.66, respectively), and also reduced anxiety. During lumbar puncture both treatments reduced anxiety, but again effects were better with hypnosis: decrease in anxiety was greater and pain was also reduced.

In an excellent study by Kuttner, Bowman and Teasdale (1988) they compared the effectiveness of hypnosis (induced with imagery), behavioural distraction

and standard medical practice in 48 children, divided into two age ranges: 3 to 6.11 years, versus 7 to 10.11 years, randomly assigned to each condition. Treatment was carried out during two marrow aspiration sessions. The dependent measures were: score on behavioural distress (PBRS-R), intensity of pain and anxiety, rated by external observers on a Likert-type 1 to 5-point scale, and subjective intensity of anxiety and pain, obtained with a face scale (CAPS). In general terms, results showed a significant interaction between age and type of treatment, indicating that hypnosis was more useful for the smaller children and distraction for the older ones. All groups showed a significant reduction of behavioural distress from the first to the second session, but the older ones were qualified by observers as less anxious and with less pain than the younger ones. Another interesting result is that no changes in self-report measures were found during the first intervention in any of the three experimental conditions, although a slight significant decrease was observed in every child's evaluation during the second session.

In summary, according to McGrath (1991), the utility of hypnosis for reducing unpleasant effects associated with medical diagnosis and treatment of children with cancer seems to be consistently proven. However, just what are the mechanisms responsible for therapeutic success is still an unresolved problem. It is not clear whether concentration of attention on a fantastic story induces a general state of relaxation which reduces physiological reactivity or if, on the contrary, it is cognitive distraction from the focus of pain that is responsible for the positive results success, or whether both processes are involved.

Relaxation/Respiration

As previously mentioned, painful sensations are usually accompanied by anxiety, rigidity or muscular tension, which may increase intensity of pain. The primary objective of relaxation techniques is to reduce these reactions. The most common way to help a child relax is by deep breathing exercises and some abbreviated method of progressive muscular relaxation, or a combination of the two, as in Dahlquist et al's work (1985). As a general guideline, children are trained to breathe deeply, slowly and rhythmically in order to relax their bodies and to make the intervention less painful. Rhythm seems to be an important requirement, and respiration must be slow and paced. It is observed that fast and superficial respiration may produce hyperventilation and dizziness, and that restraining respiration during a painful event increases tension and muscular rigidity (Kuttner, 1986). A modification introduced with younger children is to instruct them to make deep inhalations and to exhale making a whistling noise (Jay and colleagues, 1991), to breathe rhythmically by blowing into a paper streamer (Manne et al., 1990; Blount et al., 1994), or to "take a big breath" and blow out making soap "bubbles" (Kuttner, Bowman and Teasdale, 1988). It is difficult to determine the specific contribution of respiration/relaxation, since all the studies have used it in combination with other therapeutic procedures (see Appendix 1). Furthermore, it is difficult to delimit the distracting effect of these two techniques from the relaxation effect.

Treatment sets

By contrast with most literature on hypnosis and some on distraction, nearly all research since 1985 has concentrated on investigating the effectiveness of treatment programmes in which some new components are added to those already mentioned. Works by Jay and colleagues (1985, 1987 and 1991) constitute a good sample of this type of approach. The programme suggested by these authors is comprised of the following techniques: respiration exercises, imagery-distraction (emotive imagery and images incompatible with pain), filmed modelling, behavioural rehearsal and positive reinforcement (incentives). Training is carried out 30 or 45 minutes before the start of the medical intervention (marrow aspiration or lumbar puncture).

Respiration exercises are simple and similar to those previously described: deep inhalations and low whistling exhalations. *Emotive imagery* is used as a distracting strategy and to evoke emotions inhibiting anxiety. Distraction is completed with pleasant images incompatible with pain. *Filmed modelling* has the aim of allowing the child to observe how other children of the same age behave in this kind of situation. Filmed modelling provides sensorial information (feelings and thoughts) about the procedure, and, at the same time, models coping behaviour. With *behavioural rehearsal*, the aim is to get the child to practice the instructed strategies; the smaller ones "play doctor" with a doll to which a marrow aspiration must be applied, and the older ones do a demonstration. Finally, *positive reinforcement* is used to motivate the child to cooperate in the process, staying quiet and breathing the way he/she has been trained to do. As the authors say (Jay et al., 1987), this reinforcement is not technically contingent on any parti-

cular behaviour, so that they prefer to use the term "positive incentives", instead of positive reinforcers.

Jay and others (1985) showed that this set significantly reduced distress behaviour observed during marrow aspiration or lumbar puncture in five small children (3.6 to 7 years). Two years later, Jay and colleagues (1987) analysed the differential effectiveness of the programme in 56 children between 3.5 and 13 years of age, who were submitted to marrow aspiration and assigned to three experimental conditions: cognitive-behavioural treatment, 0.30mg/Kg Valium ingestion (30 minutes before the test), and attention-control (shown cartoons). Dependent variables were: observation of discomfort behaviours (OSBD), self-report on pain, and two physiological indicators, blood pressure and heart rate (pulse). Their results confirmed that subjects in the cognitive-behavioural group showed less behavioural distress, less pain and lower heart rate during the procedure than the other groups. Treatment with Valium did not differ from attention-placebo in any variable, except that subjects in that condition showed a significant reduction of systolic blood pressure. However, it was found that Valium was more useful than the other two treatments in decreasing anticipatory discomfort.

In any case, since Valium appeared to diminish anticipatory anxiety, the same authors implemented a new study in 1991 in order to find out whether this drug could increase the effectiveness of the behavioural programme. The research was carried out with 83 children ranging from 3.6 to 12 years old, who were to undergo marrow aspiration or lumbar puncture, and they were assigned to two different groups: behavioural treatment and behavioural treatment plus Valium (0.15mg/Kg). Dependent variables were similar to those of the previous study, but with two variations: blood pressure was not considered -although registered-, and a new self-report measure was included: fear experienced immediately before the start of the medical treatment. Both treatments produced significant changes in all the dependent variables, except anticipatory fear, but no differences were found between them. Moreover, the authors observed that, although there were no significant differences, subjects receiving behavioural treatment showed less behavioural distress during procedure than those who received the combined treatment. In the light of these data, it is suggested that Valium may affect the learning of trained abilities in a similar way to what occurs with other benzodiacepines in the treatment of panic or agoraphobia.

Taking into account the results obtained in these three works, it may be concluded that the treatment set proposed by Jay and colleagues consistently shows its effectiveness in reducing distress behaviour during marrow aspiration and lumbar puncture, and in lessening intensity of subjective pain, but it fails to modify anticipatory fear.

However, as is usually the case when treatment programmes with several components are used, it is very difficult to determine which are the active elements in the procedure. The programme described shares with other analysed studies the use of respiration training and imagery/distraction, whose usefulness has been demonstrated here. Thus, it is quite likely that these components alone could explain a large part of the final success. It remains to ascertain the specific contribution of filmed modelling and behavioural rehearsal. It might be expected that modelling had some direct influence on anxiety associated with medical intervention, as is suggested by Jay et al., 1991; however, in our opinion, the possibility of this is small, since the formal prerequisites needed to produce this effect are not met. In general, filmed modelling seems to be useful for treating moderately intense irrational fears. The approach to the feared stimuli must be made gradually, beginning with those evoking a lesser degree of anxiety, and the therapists must ensure that the aversive stimulus (US) will not appear during the treatment (Bragado, 1994). None of these circumstances is evident in this case: the fear experienced before the test is not irrational, the exposure to stimuli is abrupt (the child observes everything that will occur over a period of 11 minutes), the aversive stimulus will inevitably appear and exposure time is extremely short to allow a habituation process. Thus, the potential contribution of filmed modelling appears to be related to the fact that this method gives the child the opportunity to observe in an "almost real" manner how the medical procedure is carried out and what coping strategies may be used to control anxiety and mitigate pain during the course of the intervention, while behavioural rehearsal allows him/her to put into practice whatever has been observed.

One way of clarifying the differential effectiveness of each component is to ask the patients directly which of them has proved most useful for them. This is what Jay, Elliot, Katz and Siegel did (1987), asking children to choose the most helpful technique. According to this information, the most effective procedures are: respiration exercises (40%) and imagery/distraction techniques (23%). 15% of subjects chose behavioural rehearsal, 13% the film, and 9% incentives. As it can be observed, this choice is fairly consistent with experimental results.

CONCLUSIONS

It is clear from our review that, at present, there are efficient methods for alleviating child pain and distress evoked during the medical treatment of cancer. Distraction of attention from the painful focus appears to be the action mechanism underlying most of the techniques mentioned above, suggesting that it is a fundamental therapeutic component. In fact, it could be stated that all the analysed studies include some technique involving distraction, either because the child is immersed in a fantasy, or because he/she must attend to respiration rhythm, or because attention is concentrated on an appealing activity, such as video-games. According to Manne and Andersen (1991), an interesting task for future research is to find out what types of distractor are most efficient.

All the procedures used offered consistent results with respect to reduction of distress behaviour, but the effects on subjective perception of pain and anxiety are less clear. The best results in this topic are provided by works using hypnotic suggestion. However, as Jay and colleagues (1991) suggested, researchers should focus their attention on exploring other alternatives which may improve the effectiveness of cognitive-behavioural programmes, while not neglecting the search for new pharmacological solutions. A factor that may contribute to improving the effectiveness of treatment is taking into account the child's coping style, so that there are no discrepancies between it and the treatment used (Dahlquist, 1992).

A final aspect to be considered is that we scarcely have any data that permit us to know whether therapeutic achievements hold for the long term. Most studies are centred on analysing treatment effectiveness in a single session, and very few investigate whether the effects can be generalised to future interventions. Jay et al.'s results are not very encouraging, since changes observed in the first marrow aspiration did not hold for successive tests. However, this is not surprising if we consider that training consisted of only one 45-minute session. McGrath and De Veber (1986) reported that therapeutic effects lasted through 3 to 6 months of follow-up in successive lumbar punctures. In this case, the authors instructed children over six 45-minute sessions, using a treatment set similar to that of Jay and colleagues. The contrast between these two studies illustrates some of the defects to be rectified in the future.

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APPENDIX I

Cognitive-behavioural intervention for pain-distress in oncological paediatrics.

AUTHOR	SUBJECTS No. Sex	Age Diagn.	MEDICAL PROCEDURE	THERAPEUTIC OBJECTIVE (D.V.)	TREATMENT	RESULTS
Hilgard and LeBaron (1982) (1)	24	6-19 Leukaemia	Bone marrow aspiration	- Pain intensity (Self-report) -Anxiety intensity (Self-report) -Distress behaviours (Number and intensity)	Hypnosis	↓ Pain-Anxiety according to self-report ↓ Distress behaviours (1st session) No ↓ of DV in 2nd session
Zeltzer and LeBaron (1982)	33 17 males 16 females	6-17 (10.06) Leukaemia (28) Lymphoma (3) Other (2)	Bone marrow aspiration Lumbar puncture	Pain and anxiety intensity (Self-report and observation)	Hypnosis Respiration Practice Sessions (G1: B.M.A.) (G2: L.P.) Vs. Respiration Practice Sessions Distraction (G3: A.M.O) (G4: L.P.)	B.M.A.: ↓ Pain and anxiety in both groups; greater in G1. Hypnosis more effective in ↓ of anxiety L.P.: ↓ Pain and anxiety greater in G2 No significant difference in age between groups
Zeltzer, Kellerman, Ellenberg and Dash (1983) (2)	12 7 m 5 f	Adolesc (14) Hodgkin (4) Haemato. (2) Other (6)	Chemotherapy	-Frequency, duration, intensity of vomiting after chemotherapy (Self-report) -Locus of control (Self-report) - Self-esteem (Self-report) - Disease impact (Self-report) - Anxiety Trait (Self-report)	Hypnosis	8 children accepted treatment with hypnosis 53% ↓ Freq., Intens. of vomiting ↓ in duration of vomiting in 6 out of 8 children ↓ Anxiety Trait
Kellerman, Zeltzer, Ellenberg and Dash (1983) (3)		Adolescents	Bone Marrow aspiration Lumbar puncture Intravenous injections	-Pain and anxiety intensity (Self-report)	Hypnosis	89% ↓ pain and anxiety. No habituation to procedure.
LeBaron and Zeltzer (1984a) (4)	8	10-18 (12) Leukaemia (6) Bones (2)	Chemotherapy	-Nausea and post-chemotherapy vomiting intensity (self-report and observation) - Activities alteration (self-report and observation) - Degree of discomfort (self-report and observation)	Hypnosis	↓ in every DV (dependent variab)
Zeltzer, LeBaron and Zeltzer (1984)	19	6-17 (11.3) Leukaemia (11) Bones (5) Lymphoma (3)	Chemotherapy	- Intensity of nausea and post-chemotherapy vomiting. (self-report and observation) - Degree of discomfort (self-report and observation)	Hypnosis (G1) Vs Distraction (G2)	↓ Nausea and vomiting in G1 and G2 in treatment and follow-up ↓ In degree of discomfort evoked by chemotherapy symptoms in G1 and G2
Kolko and Rickard Figueroa (1985)	3 2m 1 f	11-13 Leukaemia	Chemotherapy	- No. of anticipatory symptoms (self-report) - Degree of distress due to symptoms after chemotherapy. - Anxiety State (self-report) - Anticipatory distress behaviour (No.)	Distraction	↓ No. of anticipatory symptoms ↓ Degree of distress evoked by chemotherapy ↓ Anticipatory Anxiety-State ↓ Anticipatory distress behaviour
Dahlquist, Gil, Armstrong et al. (1985)	3 2 m 1 f	11-13 Lymphoma (1) Bone sarcoma (2)	Chemotherapy	- Distress behaviour (No. and intensity) - Distress intensity (self-report) - Distress intensity (parents' report and medical staff)	- Exposition in imagery plus coping self-instructions - Relaxation/Respiration plus pleasant images - Positive Reinforcement.	↓ Distress behaviour in every child ↓ Self-reported distress in every child during chemotherapy ↓ Distress in 2 children before and after chemotherapy (self-report) ↓ Distress intensity observed by medical staff in every child. No change in distress intensity observed by parents.
Jay, Elliot, Ozolins, et al. (1985)	5 31/2-7 2 m 3 f	Leukaemia	Bone marrow aspiration Lumbar puncture	- Distress behaviour (Number and intensity)	- Respiration - Emotive imagery - Behavioural trial. - Filmed modelling - Positive reinforcement	↓ Distress behaviour in the 5 children in the first intervention ↓ Distress behaviour in 4 children in the second intervention.
McGrath and De Veber (1986)	14 9 m 5 f	3-14 (7.6) Leukaemia	Lumbar puncture	- Pain and anxiety intensity. (self-report) - Pain and anxiety intensity (parents' and nurse's report) - Distress behaviours (Number)	- Information about L.P. - Guided imagery - Expectations modification - Hypnotic suggestions - Relaxation Desensitisation	↓ of pain and anxiety in treatment and follow-up ↓ Distress behaviour number.

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Cognitive-behavioural intervention for pain-distress in oncological paediatrics.

AUTHOR	SUBJECTS No. Sex	Age Diagn.	MEDICAL PROCEDURE	THERAPEUTIC OBJECTIVE (D.V.)	TREATMENT	RESULTS
Jay, Elliot, Katz and Siegel (1987)	56 36 m 20 f	3-13 (6.7) Leukaemia	Bone marrow aspiration	- Distress behaviour (No. and intensity) - Pain intensity (self-report) - Heart rate and blood pressure	- Filmed modelling - Respiration - Imagery / Distraction - Behavioural trial - Positive reinforcement (G1) Vs - Valium (G2) Vs - No intervention (cartoons) (G3)	↓ Observed distress ↓ Pain self-report and psychophysiolog- ical measures in G1 ↓ Systolic pressure in G2 compared to G3 ↓ Anticipatory distress in G2; distress level did not change during intervention
Katz, Kellerman and Ellenberg (1987) (5)	36	6-12 Leukaemia	Bone marrow aspiration	- Distress behaviour (No. and intensity) -Pain and fear intensity (self-report) - Anxiety intensity (nurse's report)	- Hypnosis (Exp. Group) Vs - Non-guided play session	↓ Self-reported pain in E.G. and C.G. No significant ↓ of distress behaviour ↓ globally ↓ Sex differences: ↓ distress behaviour in children with hypnosis. Better tolerance to B.M.A. in children who played.
Redd, Jackobsen, Die-Trill et al. (1987) Experiment 1	26 19 m 7 f	9-20 (14) Leukaemia (7) Lymphom (6) Sarcoma (11) Other (2)	Chemotherapy	- Nausea intensity (self-report) - Nausea related behaviours (No.)	Distraction (E.G.) Vs Access to books, TV and games (C.G.)	↓ Nausea intensity and No. of responses in E.G.
Experiment 2	15 11 m 4 f	9-18 (12.7) Leukaemia (6) Lymphom (4) Brain (1) Sarcoma (4)	Chemotherapy	- Nausea intensity (self-report) - Anxiety intensity (self-report) - Heart rate and blood pressure.	Distraction	↓ Nausea intensity playing with videogames, with no significant results in anxiety. Non-significant increase in systolic pressure associated with an increase in activation.
Kuttner, Bowman and Teasdale (1988)	48 15 m 15 m 10 f 8 f	3-10 (6-11) 3-6 7-10 3-6 7-10 Leukaemia	Bone marrow aspiration	- Distress behaviours (No.) - Pain and anxiety intensity (Observation) - Pain and anxiety intensity (self-report)	- Distraction (G1) Vs - Imagery with hypnotic suggestion (G2) Vs - Standard medical practice (C.G.)	1st treatment session: ↓ distress behaviour in children 7-10 years in G1. Most efficient distraction in ↓ of anxiety and pain observed in older group. Imagery is more efficient in younger group. No changes in self-reported pain and anxiety. 2 treatment sessions: Effectiveness of treatment increases from Session 1 to Session 2
Manne, Redd, Jacobsen, et al. (1990)	23 11 m 12 f	4-9 4-7 3-9 Leukaem (13) Other (9)	Intravenous injections	- Distress behaviours (No. and intensity) - Pain and fear intensity (self-report) - Observed pain intensity and own anxiety (parents' report) - Observed distress intensity. Difficulty of injection and own anxiety (nurse's report)	- Respiration - Distraction - Positive reinforcement (E.G.) Vs - Attention-placebo (C.G.)	↓ Distress behaviour in E.G. ↓ Parents reported pain in E.G. ↓ Parents anxiety (E.G.) No ↓ in nurse anxiety No significant ↓ in children's pain self-report.
Jay, Elliott, Woody and Siegel (1991)	83 45 m 38 f	3 1/2-12 (6.3) Leukaemia Lymphoma	Bone marrow aspiration Lumbar puncture	- Distress behaviours (No. and intensity) - Pain and fear intensity (self-report) - Heart rate (beats)	- Filmed modelling - Respiration - Imagery / distraction - Behavioural trial - + reinforcemt (G1) Vs - Same treatment as G1 plus Valium (G2)	In both groups, ↓ observed distress, ↓ Self-reported pain and ↓ in heart rate No changes in fear.
Mansson, Bjorkhem and Wiebe (1993)	30 19 m 11 f	4-17 (8.2) Leukaemia Lymphoma	Chemotherapy Lumbar puncture	- Anxiety behaviour (Intensity) (Observer, nurse and parents' report) - Non- cooperative behaviour (intensity) (Observer, nurse and parents' report) - Pain intensity (Self-report)	Familiarisation programme with procedure in 1 L.P. (G1) Vs - Same treatment as G1 in 3 L.P. (G2) Vs - No preparation (C.G.)	Children younger than 8 evaluate their pain higher than older ones in the 3 groups. Adults score higher in anxiety and non- cooperative behaviour than children under 8. No differences in self-reported pain among groups.
Broome, Lillis, McGahee and Batess (1994)	14 11 m 3 f	3-15 (6.6) Leukaemia	Lumbar puncture	- Pain and fear intensity (self-report) - Distress behaviour (No. and intensity) - Parents' State-trait anxiety (Self-report) - Parents' distress behaviours (intensity)	- Relaxation / Respiration - Imagery (distraction)	↓ Distress behaviour in 8 children. ↑ Distress behaviour in 6 children ↓ self-reported pain in 12 children Parents' distress behaviour remained stable and low intensity No changes in fear No changes in parents' state anxiety.
Blount, Powers, Cotter et al. (1994)	3 2 m 1 f	4-7 Leukaemia	Bone marrow aspiration Lumbar puncture	- Distress behaviours (No. and intensity) - Parent-child interaction behaviour (No. and type)	- Parents' training - Respiration - Distraction - Trial - +Reinforcemt	↑ No. of parents' support behaviours. ↑ No. of children's coping behaviours. ↓ No. of distress behaviours in 2 children

E.G. Experimental group; C.G. Control group; D.V. Dependent variable; BMA, Bone marrow aspiration; L.P. Lumbar puncture.

* Figures in brackets indicate mean age.

(1) Reviewed in Lavigne, Schulein and Hann (1986), Manne and Andersen (1991), Whitehead (1989) and Hilgard and LeBaron (1984)

(2) Reviewed in Carey and Burish (1988), Morrow and Dobkin (1988) and Whitehead (1989)

(3) Reviewed in Manne and Andersen (1991)

(4) Reviewed in Carey and Burish (1988), Morrow and Dobkin (1988) and Whitehead (1989)

(5) Reviewed in Varni and Katz (1988) and Manne and Andersen (1991).

APPENDIX II

Assessment methods used in the studies reviewed

AUTHORS	METHODS AND INSTRUMENTS	VARIABLES ASSESSED
ZELTZER and LeBARON (1982)	- SELF-REPORT 5-point scale	Pain intensity and anxiety intensity assessed during medical procedures.
	- INDEPENDENT ASSESSOR'S OBSERVATION. 5-point scale	(id) (id)
ZELTZER, LeBARON and ZELTZER (1984)	- SELF-REPORT 0-10 Likert scale	Nausea/vomit intensity and degree of discomfort produced by these symptoms evaluated within 3-5 days after administration of chemotherapy.
	Stanford Hypnotic Clinical Scale for Children (Morgan and Hilgard, 1978/79)	Susceptibility to hypnosis assessed after psychological intervention.
	- PARENTS' OBSERVATIONS 0-10 Likert scale	Nausea/vomit intensity assessed 3-5 days after administration of chemotherapy.
	- MEDICAL RECORDS	Use of antiemetics, type and doses.
KOLKO and RICKARD-FIGUEROA (1985)	- INDEPENDENT ASSESSOR'S OBSERVATION Modified Procedure Behaviour Rating Scale (PBRS) Katz et al, 1980)	No. of distress behaviours observed 5 min. before chemotherapy begins.
	- SELF-REPORT 24 hr. Symptom Checklist (Elaborated by the authors for the present study)	No. of anticipatory symptoms collected 15 min. Before chemotherapy.
	Chemotherapy Experience Schedule (Elaborated by the authors for the present study)	Degree of distress produced by chemotherapy collected 15 min. after it finishes.
	State-Trait Anxiety Inventory (STAI) (Spielberger, 1973).	Anxiety intensity collected 15 min. before chemotherapy.
DAHLQUIST, GIL, ARMSTRONG, et al. (1985)	- SELF-REPORT 7-level thermometer	Distress intensity evaluated before/during/after medical procedure
	- INDEPENDENT ASSESSOR'S OBSERVATION Observational Scale of Behavioural Distress (OSBD) (Jay et al., 1983)	Number and intensity of distress behaviours evaluated during medical procedure.
	- PARENTS' OBSERVATION 7-point scale	Distress intensity assessed before/during/after medical procedure
	- MEDICAL STAFF OBSERVATION 7-point scale	Distress intensity evaluated during medical procedure.
JAY, ELLIOTT, OZOLINS et al. (1985)	- INDEPENDENT ASSESSOR'S OBSERVATION (OSBD)	Number and intensity of distress behaviours registered before and during medical procedure.
McGRATH and DE VEBER (1986)	- PARENTS' OBSERVATION Analogical-Visual Scale	Pain intensity and anxiety intensity evaluated after medical procedure
	Distress behaviours list	Number and intensity of distress behaviours evaluated before or during medical procedure.
	- NURSE'S OBSERVATION Analogical-Visual Scale	Distress and anxiety intensity assessed after medical procedure.
	Distress behaviours list	Number and intensity of distress behaviours assessed before or during medical procedure.
	- SELF-REPORT Analogical-Visual Scale	Pain intensity evaluated after medical procedure Discomfort level evoked by pain assessed after medical procedure
	Face Scale	Ability to control pain, expectations and attitudes towards lumbar puncture.
JAY, ELLIOT, KATZ and SIEGEL (1987)	- INTERVIEW - INDEPENDENT OBSERVER'S EVALUATION (OSBD)	Number and intensity of distress behaviours observed during medical procedure
	- SELF-REPORT 0-100 Pain thermometer	Pain intensity assessed immediately after medical procedure.
	- PSYCHOPHYSIOLOGICAL MEASURES Dinamap 845 model	Heart rate and blood pressure registered immediately before starting medical procedure.
REDD, JACOBSEN, DIE-TRILL et al (1987)		
Experiment 1	- SELF-REPORT Analogical-Visual Scale	Nausea intensity evaluated before and during chemotherapy
	- INDEPENDENT ASSESSOR'S OBSERVATION (12 nausea-related behaviours list)	(id)
Experiment 2	- SELF-REPORT Analogical-Visual Scale	(id)
	- SELF-REPORT Analogical-Visual Scale	Anxiety intensity evaluated before or during chemotherapy.
	- PSYCHOPHYSIOLOGICAL MEASURES Medtek BPI 520 model	Heart rate and blood pressure registered before and during chemotherapy.

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Assessment methods used in the studies reviewed

AUTHORS	METHODS AND INSTRUMENTS	VARIABLES ASSESSED
KUTTNER, BOWMAN and TEASDALE (1988)	- INDEPENDENT OBSERVER'S EVALUATION (PBRS-R) 5-point Likert scale	Number of distress behaviours observed during medical procedure Anxiety and pain intensity assessed after medical procedure.
	- SANITARY PERSONNEL OBSERVATION 5-point Likert scale	Pain and anxiety evaluated immediately after medical procedure out of intervention room.
	- PARENTS' OBSERVATION 5-point Likert scale	(id) (id)
	- SELF-REPORT Children's Anxiety and Pain Scale (CAPS) (see Kuttner and LePage, 1989)	Pain and anxiety intensity assessed immediately after medical procedure out of intervention room.
MANNE, REDD, JACOBSEN et al. (1990)	- INDEPENDENT ASSESSOR'S OBSERVATION (PBRS-R)	Number of distress behaviours observed during medical procedure
	- PARENTS' OBSERVATION Analogical-visual scale	Pain intensity registered immediately after medical procedure
	- NURSE'S OBSERVATION 5-point Likert scale	Process difficulty and distress intensity registered after medical procedure
	- PARENTS' SELF-REPORT Analogical-Visual scale	Their own anxiety intensity evaluated after medical procedure
	- NURSE'S SELF-REPORT 5-point Likert scale	(id)
	- CHILD'S SELF-REPORT Face scale	Pain intensity and degree of fear recorded after medical test.
JAY, ELLIOT, WOODY and SIEGEL (1991)	- INDEPENDENT ASSESSOR'S OBSERVATION (OSBD)	Number and intensity of distress behaviours observed during medical test
	- SELF-REPORT Face Scale	Pain intensity evaluated 5 min. after end of medical test. Degree of fear rated just before medical procedure begins.
	- PSYCHOPHYSIOLOGICAL MEASURES Dinamap 845 model	Heart rate registered immediately after medical procedure begins
MANSSON, BJÖRKHEM and WIEBE (1993)	- PARENTS' OBSERVATION Anxiety scale and non-cooperative behaviours (adapted from Venham et al., 1980)	Anxiety intensity and extent of non-cooperative behaviour registered immediately after medical test.
	- NURSE'S OBSERVATION Anxiety and non-cooperative behaviours scale (adapted from Venham et al., 1980)	(id)
	- SELF-REPORT Analogical-Visual scale	Pain intensity rated immediately after medical procedure.
	- VIDEO RECORDING AND EVALUATION	Number and intensity of distress behaviours observed during medical test.
BROOME, LILLIS, McGAHEE and BATES (1994)	- INDEPENDENT ASSESSOR'S OBSERVATION (OSBD) Parent Behaviour Tool (Broome and Endsleigh, 1989)	- Number and intensity of distress behaviours observed during medical test. - Number and intensity of parents' distress behaviours observed during medical procedure.
	- SELF-REPORT Child Medical Fear Scale (Broome et al., 1988)	Fear intensity evaluated after medical procedure.
	Baker-Wong Faces Scale (Wong and Baker, 1988)	Pain intensity registered after medical procedure.
	- PARENTS' SELF-REPORT (STAI)	Intensity of their own anxiety evaluated after medical procedure.
BLOUNT, POWERS, COTTER et al (1994)	- INDEPENDENT ASSESSOR'S OBSERVATION Child-Adult Medical Procedure Interaction Scale (CAMPIS) (Blount et al., 1989)	Parent-Child interaction observed during medical procedure.
	Observational Scale of Behavioural Distress (OSBD) (Jay et al, 1983)	Number and intensity of distress behaviours observed during medical procedure.