

## A Study of the Effects of Visual and Performing Arts in Health Care

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The research was carried out at Chelsea and Westminster Hospital from 1999 to 2002

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## Index

Executive Summary	Page 3
Conclusions	Page 5
Glossary	Page 6
Medical Day Unit	Page 11
Antenatal Clinic	Page 15
Maternity Unit (Labour and Delivery rooms)	Page 21
Post-natal Ward	Page 27
Day Surgery Unit & Trauma and Orthopaedic Ward	Page 29
HIV/AIDS Unit	Page 38
Staff Evaluation	Page 41
Appendix	Page 46

## Executive Summary

The research project has designed a unique approach to scientifically evaluate the effect of visual and performing arts in health care. This is a subject of concern for a wide range of professionals, including health authorities, policy makers, medical and nursing staff, architects, artists, and administrators.

The research explores whether visual and performing arts could have an effect on psychological, physiological and biological outcomes of clinical significance.

A protocol was designed after extensive consultation with medical, nursing and managerial staff of each selected area of research. The appropriate measurements were identified for each clinic, the size of the sample predicted, and the characteristics for both control and study group established. Each protocol was implemented with the full support of clinicians, nursing staff and managers after being approved by the hospital's Ethics Committee.

Units of research were established in the following clinics of Chelsea and Westminster Hospital:

- ❑ Medical Day Unit
- ❑ Antenatal Clinic
- ❑ High-Risk Clinic
- ❑ Maternity
- ❑ Post-natal Ward
- ❑ Day Surgery Unit
- ❑ Trauma and Orthopaedics Ward
- ❑ HIV/AIDS Services
- ❑ staff evaluation

The data obtained from each unit of research was entered into specially designed databases and analysed statistically.

The results of this research provide the evidence that the integration of visual and performing arts into the health care environment induce psychological, physiological and biological outcomes which could have clinical significance.

Effect of visual and performing arts on levels of anxiety and depression of patients treated in the following clinics:

Medical Day Unit

- Live music was more effective in diminishing the levels of anxiety of patients receiving day chemotherapy treatment than visual art
- Visual art was more effective in diminishing the levels of depression in the same group of patients

Antenatal Clinic

- Music, breathing and relaxation, as part of antenatal care, significantly reduced anxiety and depression in pregnant women

Postnatal Ward

- Levels of anxiety and depression of women who have given birth were significantly lowered after a programme of live music

Day Surgery Unit

- Patients exposed to visual arts and live music during the preoperative process showed significantly lower levels of anxiety and depression than patients who were prepared for surgery in the absence of the arts

The effect of visual and performing arts on physiological and biological outcomes was measured in the following clinics:

Antenatal Clinic

- Live music increased significantly the number of accelerations of foetal heartbeat - a sign of well-being. It also induced a strong association between the heartbeat of the mother and the heartbeat of the unborn child

Antenatal High Risk Clinic

- Live music performed in the waiting area of the clinic was effective in lowering the blood pressure of patients waiting for their appointments

Maternity Unit

- Duration of labour was 2.1 hours shorter and the requests for epidural analgesia diminished when women in labour were in the presence of a specially designed screen which was installed in the room

Day Surgery Unit



## GLOSSARY

**Anxiety.** It is a vague, uneasy feeling, the source of which is often non-specific or unknown to the individual. It is a response to the anticipation of impending danger and dread accompanied by restlessness, tension, tachycardia, and difficulty in breathing.

**Blood Pressure.** The pressure exerted by the circulating volume of blood on the walls of the arteries and veins, and the chambers of the heart. Systolic blood pressure corresponds to the maximum value, and diastolic to the minimum.

**Cortisol.** A neuroendocrine hormone that occurs naturally in the body and when raised is associated with stress.

**Depression.** A mood disturbance characterised by feelings of sadness, despair, and discouragement

**Epidural Anaesthesia/Analgesia.** A type of regional pain blocker.

**Heartbeat.** A complete cycle of cardiac muscle contraction and relaxation.

**Heart rate.** The pulse, calculated by counting the number of ventricular beats per minute.

**Lymphocytes.** These white blood cells are divided into two groups: B cells and T cells. B cells synthesise antibodies and T cells are involved in cellular immunity; they are present in a number of subsets, such as: CD4 called helper cells, and CD8 known as killer cells.

**Mean:** Used to give information of the statistical analysis when the distribution of the data is symmetric.

**Median.** Used to give a summary statistic when the distribution of the data is skewed. The quartiles divide the data into four equal parts. The interquartile range is given as the lower and upper quartiles.

**NHS.** National Health Service in the United Kingdom.

**p-values.** Estimates the degree of statistical significance of the data;  $p < 0.05$  describes statistically significant results.

**Postpartum depression.** Describes an emotional effect of childbirth experienced by some women for a period of about 72 hours.

## A Study of the Effects of Visual and Performing Arts in Health Care

### A Scientific Approach

We all aspire to live a healthy life, but what is health? The World Health Organisation defines it as 'a state of complete physical, mental and social well-being and not merely the absence of disease'. A recent article posed a provocative question 'Is it possible to be severely disabled, in pain, close to death, and in some sense "healthy"?' The author argues that it is possible because health comes from adaptation to, and acceptance of, circumstances (1). It is the role and the responsibility of society to provide the right supportive environment, and is indeed 'in the interests of sustainable development to help ensure the health and well-being of future generations; there are urgent and widespread educational, information sharing and research needs, for which universities, service departments and professional organisations have important roles' (2).

The European Charter on Environment and Health, declares that 'good health and well-being require a clean and harmonious environment in which physical, psychological, social and aesthetic factors are all given their due importance' (3). The integration of the visual and performing arts into healthcare environments can play a crucial role in achieving these objectives. Evidence is needed to demonstrate that this integration could induce beneficial psychological, physiological and biological patient outcomes, support staff and visitors and enhance the quality of service and potentially produce cost-effective benefits.

There is extensive literature analysing the effects of different factors, such as design, colour, music and visual art in health care. Research studies indicate a link between poor architectural design and patients' increased levels of blood pressure and anxiety (4), and also higher consumption of analgesia (5). A controlled study showed that exposure to visual stimulation including views of nature, in intensive care units promotes positive outcomes on patients recovering from open-heart surgery (6). Undoubtedly, architects and designers recognise that buildings 'should promote wellness by creating physical surroundings that are psychologically supportive' (7). Until now, however, the reports are mostly based on anecdotal information or opinion-based surveys (8). The literature also presents the findings of experimental studies

designed to explore how the use of art as therapy could influence patient outcomes in particular clinical settings.

This research project investigates a different angle; it produces quantitative evidence of the therapeutic effect achieved by the integration of visual and performing arts into the health care environment.

Chelsea and Westminster Hospital, London's newest NHS teaching hospital, opened in 1993, pioneering a new approach by incorporating works of art at drawing-board stage to complement innovative architectural design. Chelsea and Westminster Hospital Arts, funded entirely by private donations, has been working within the hospital since its conception, to provide all the visual arts and live performances in public areas, clinics and wards. The integration of this extensive arts programme into the hospital environment provided the ideal setting for answering the question of whether visual art and live music can play a meaningful role in healthcare, a question which concerns a wide range of professionals: architects, artists, health authorities, medical staff and administrators. The need for a scientific evaluation has long been recognised.

### Objectives

- ❑ To produce a quantitative evaluation of the effects of the visual and performing arts on patients, staff and visitors. The results are published elsewhere (9, 10).
- ❑ To answer whether the integration of the arts in health care can induce physiological and psychological changes of clinical value.
- ❑ To find out whether the visual and performing arts can induce changes in physiological responses.
- ❑ To establish staff attitudes towards this particular environment and the potential effect that it could have on job satisfaction, recruitment and retention.

### Methodology

This research study, by the very nature of its objectives, needed to bridge the activities of Chelsea and Westminster Hospital Arts and the health care environment without interfering with hospital routine. Each protocol was designed after extensive consultation with clinicians, nurses and/or managers responsible for each of the chosen clinical units. This approach was followed to identify the type of measurements which might indicate outcomes of clinical significance, and formed the basis of each designed protocol. It was essential to reach mutual understanding of clearly defined protocols and well-defined objectives before starting a new unit of research, and

adapt the requirements of the study to the clinic's routine without imposing changes in procedures or extra work for the staff; their support and collaboration in this respect is greatly appreciated.

Protocol design: the only variable introduced throughout this research was either the presence or the absence of visual art and/or live music. The design of each protocol includes:

- ❑ Control group formed by subjects attending clinics or receiving treatment in the absence of visual art and or live music
- ❑ Study group formed by subjects attending the same clinics or receiving the same treatment in the presence of visual art and or live music
- ❑ Construction of a database with the data retrieved from the patients' notes after obtaining their consent
- ❑ Statistical analysis of the results
- ❑ Information for patients and patient's consent form
- ❑ Approval by the hospital's Ethics Committee
- ❑ The measurements were carried out in the same part of the clinic, at the same time of the week, for the same treatment or medical procedure, with the same medical team

#### Measurements and units of research

Psychological changes, such as anxiety and depression were evaluated using the Hospital Anxiety and Depression scale (11). Patients were invited to complete this specially designed scale before and after the intervention of visual arts and /or live music. The data was analysed statistically. These measurements were taken in the following clinics:

- ❑ Medical Day Unit
- ❑ Antenatal Clinic
- ❑ Post-natal Clinic
- ❑ Day Surgery Ward

Physiological and biological changes measured in the presence or absence of visual art and/or live music include:

- ❑ Levels of blood pressure : High-risk Antenatal Clinic and Day Surgery Unit
- ❑ Foetal Heartbeat/pulse: Antenatal Clinic
- ❑ Heart rate: Antenatal Clinic and Day Surgery Unit

- ❑ Cortisol and Immunoglobulin A levels: Day Surgery Unit
- ❑ Cell counts: HIV/AIDS Clinic

The impact of visual arts and/ or live music was also measured by:

- ❑ Length of labour in: Maternity Ward
- ❑ Length of stay in hospital in: Trauma and Orthopaedics Ward
- ❑ Amount of analgesics: Trauma and Orthopaedics Ward
- ❑ Requirement for analgesia/anaesthesia: Maternity Ward
- ❑ Amount of induction agents prior to anaesthesia: Day Surgery Unit
- ❑ Staff evaluation

A thorough review of the literature including the latest medical findings was conducted for each area of research in order to establish and rightly interpret the relevant physiological and biological measurements. A clear understanding of patient management and of the routine of each particular unit was given equally importance.

It is common practice in medical science to conduct randomised controlled trials to make comparative studies between a new and a standard treatment, or between alternative forms of healthcare. The nature of this research project required pragmatic adaptations since it was not always possible to randomise the participating groups; however, they were all done as controlled, blind or double-blind studies, carefully crafted to avoid the introduction of bias which might have undermined the validity of the evidence. Blind assessment means that the person conducting the trial is unaware of the treatment/changes the patient receives and double-blind assessment is established when both patient and provider are equally unaware of the treatment/changes. This research project applied one or the other as appropriate.

This study used a statistical formula to pre-determine the minimum number of participants, for both the control and the trial group in each area of research. This formula takes into account the expected difference of the chosen measurement due to the introduction of different conditions, and ensures that the size of the sample is large enough to produce statistically significant differences.

To maximise objectivity in each area of research the data was retrieved from the patients' notes, after obtaining written consent from both the patient and the hospital's Ethics Committee, aiming to diminish the incidence of any bias by either the patient or medical staff.

The succeeding chapters develop the rationale followed in each area of research, the methodology applied, implementation procedures, results and conclusions. An expanded statistical analysis of each protocol can be found in the section 'Appendix'.

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## MEDICAL DAY UNIT

The Medical Day Unit treatment room has site-specific murals, pictures on the walls and received regular sessions of live music. The need to provide evidence that the integration of the arts into the health care environment benefits patients, staff and carers prompted research in this area, a study very much welcomed and supported by the unit's medical and nursing staff.

In 1998, Surinder Singh wrote 'Around Every Tumour There's a Person' (1); indeed, for decades several studies have shown the impact that the psychological state of patients undergoing chemotherapy have on their wellbeing. The relationship between fatigue, circadian rhythms and depression in breast cancer patients during chemotherapy cycles has recently been established (2). Anxiety was found to be implicated in the development of chemotherapy-induced side effects (3). It has also been reported that patients' wellbeing induces an increase in their salivary immunoglobulin A, which is an indicator of the state of the immune system, together with a decrease in the level of cortisol, a hormone directly related to stress (4).

The consultation with medical and nursing staff identified anxiety and depression in patients receiving chemotherapy treatment as issues of major concern.

The protocol was designed to answer the question of whether the incorporation of visual arts and/or live music in the Medical Day Unit influences the emotional and psychological needs of patients undergoing chemotherapy treatment.

Protocol: The Zigmond and Snaith's Hospital Anxiety and Depression Scale was used for assessing patients' responses (5); in addition, the research collected data of the patients' responses to the visual art in the treatment room and to the live performances. An adapted version of a specially designed evaluation form was used (see Appendix).

The research was carried out on the same week day and at the same time of day, over a period of six months. The data was collected from the following groups:

- control group: patients receiving treatment in the absence of visual art and/or live music
- study group-music: patients treated in the presence of live music
- study group-visual art: patients treated in the presence of visual art.

Written information on the aims and objectives of the research, and a request for patients' consent were routinely distributed. Ninety one patients consented to participate in the study. The anxiety and depression scale was completed by 57 patients (63% of the total), and the evaluation

form by 83 patients (91%). The distribution of genders was almost evenly balanced: 43 women and 40 men ranging from 20 to 90 years of age.

The research was carried out for a total of 24 weeks divided into terms of 8 weeks per group. Live music provided a varied programme of light, classical and world music by string quartets, harpists, guitarists and pianists. It was played either inside the treatment room or in its vicinity. 'Visual art' consisted in pictures which were specially selected from 'Paintings in Hospitals' collection, and included landscapes, marine pictures, portraits, figurative and abstract works, and were changed every week.

The therapeutic effect of music in the treatment of cancer patients has been widely reported in the medical literature. The experimental work tested the effect of self-selected music delivered by headphones showing that it induces a significant improvement in patients' capacity to deal with stress and anxiety (6, 7, 8). This study explores the effect of live music as an integral part of the health care service.

### Results

Statistical analysis of the data collected from patients receiving treatment in the presence of live performances showed a decrease of 32% in their levels of anxiety and of 31% in their levels of depression, compared to the same number of patients in the control group.

The results from the study group in the presence of visual art showed that anxiety levels were 18% lower and depression scores were 34% lower than in the control group.

The second part of this research evaluated the responses of patients to the introduction of the arts into the treatment room. Statistical analysis of the data indicated that 90% of patients noticed the display of visual arts despite their medical problems; 79% of respondents gave a very high positive response to the issues concerning attraction and enjoyment of the pictures; while self-assessment of the effect of the works of art in helping to distract from medical worries showed that for 47% it was highly effective, and for 33% of patients it had a moderate effect. When patients were asked whether the art in the room changed their mood for the better, 80% of respondents were emphatically positive. As for their response on the effect of easing stress levels, 65% responded positively, 27% noted a moderate effect, and only 8% expressed indifference. For 87% of patients visual art is considered a main factor in creating a pleasant environment.

How did patients respond to the presence of live music in the treatment room? Half an hour before each concert began, the programme was distributed to each patient. The statistical

analysis of the data showed that 68% of the patients were highly interested, 27% were moderately interested and only 5% showed very little interest. Seventy five percent said that they greatly enjoyed the performance, while 2.5% disagreed. The presence of musicians changed the atmosphere of the treatment room for the better. Sixty four percent of the respondents acknowledged that their presence helped them ‘very much’ in distracting them from medical worries and that it had indeed changed their mood for the better. Eighty four percent of respondents consider that the arts play a positive role in health care and 86% considered the value of Hospital Arts' work to be very important.

### Conclusions

It is interesting to note that the group of patients treated in the presence of visual art showed lower levels of depression than the group listening to live music, whereas live performances were significantly more effective in reducing levels of anxiety. A recent article reiterated the importance of incorporating artworks in cancer centres (9). The use of live music might be more

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### WOMEN AND CHILDREN'S DIRECTORATE

This report presents the findings of the effect of live music on women attending different clinics under this directorate. The studies carried out are:

- Antenatal Clinic - Heartbeat of the unborn child and the heart rate of the expectant mother
- Antenatal Clinic - Breathing and relaxation antenatal classes
- High-risk Antenatal Clinic - Levels of blood pressure
- Post-natal Ward - Anxiety and depression after birth

The effect of visual art on:

- Maternity Ward - Length of labour and requirement for analgesia

### Antenatal Clinic

#### The effect of live music on the heartbeat of the unborn child and the heart rate of the expectant mother

The fascinating field of prenatal stimulation explores the connection between mother and her unborn child through the auditory system by the effect of voices or music. Some authors suggested that the pleasure of listening to music revives the primitive auditory fusion of the foetus with the mother (1), and others explored its influence on the degree of intelligence (2), and on the development of superior musical abilities later in childhood (3). In spite of the fact that some of these findings remain controversial, there is a consensus on the importance of listening to music during pregnancy.

The understanding of the mechanisms underlying the response of the foetus to the stimulus of the outside world is constantly progressing with the aid of advanced technology. The response of

the foetus to sound can be detected by ultrasound as early as 16 weeks of gestation, suggesting that sounds and rhythms received through the womb could be involved in foetal brain development (4). After the 28<sup>th</sup> week of gestation the inner and outer ear of the foetus is properly developed indicating that the unborn child can hear (5).

Based in this knowledge, a protocol was designed to study the effect of live music on the heartbeat of the foetus and to establish whether there is an association with the heart rate of the expectant mother.

Protocol (This study includes women who were beyond the 30<sup>th</sup> week of pregnancy).

Pregnant women who were attending antenatal classes and became interested in being part of this study were invited to attend the special sessions of live music organised by Chelsea and Westminster Hospital Arts. Each session was performed by no more than two or three musicians playing classical, jazz or country music. A number of issues were considered: the size of the room and the height of the ceiling; the number of women per session; the type of instruments, which were carefully chosen for appropriateness and suitability. We found that the most acceptable instruments were piano, violin, flute, and harp. The study always took place in the same room, on the same day of the week and at the same time, and we counted on the active collaboration of midwives.

The heartbeat of the foetus was registered using the electronic foetal monitoring machine or cardiotocograph (CTG). Midwives were responsible for connecting participants, who lay in the left lateral position or sat comfortably, to the CTG machine and for registering their pulse.

- ❑ Control or baseline trace: the heartbeat of the unborn child was recorded during 20' in the absence of live music
- ❑ Study trace: obtained after 20' in the presence of live music

There was no interruption between the time with or without music, and most of the mothers choose to remain connected to the CTG for an extra 10' after the music had ended.

- ❑ Simultaneously, every 5' the midwife registered the pulse of the mother

The interpretation and quantification of each recorded tracing of the heartbeat of the foetus was done following the instructions of senior midwives and the 2002 guidelines of the National Institute for Clinical Excellence (NICE). The response to an outside stimulus is registered in the tracing as a peak, which is known as an acceleration, and by definition has to show an increase of 15 beats per minute lasting at least 15 seconds. The presence of two or more accelerations in a 20 minute period indicates a reactive response, and is considered a sign of good foetal health.

The number of accelerations counted during the first 20' without music in each of the recorded tracing constituted the baseline figure, and it was compared to the number of accelerations found after the stimulus by the live music. A database was constructed with both sets of data and statistically analysed.

### Results

The results from a group of 25 participants showed a significant increase in the number of accelerations. Four times more accelerations were recorded as a direct response to the sound of live music. Interestingly, this effect lasted for at least 10 minutes after the music ended.

We also found a strong association between the heartbeat of the foetus and the pulse of the mother. When the pulse rate of the mother was steady and normal, reflecting her state of relaxation, the heartbeat of the unborn child responded by increasing the number of accelerations.

As mentioned before, the increase of the number of accelerations is a sign of foetal wellbeing and has clinical significance. Indeed, heartbeat tracings showing the opposite result or deceleration require immediate medical intervention.

### Conclusions

This research provides evidence that the introduction of live music in a programme of antenatal classes brings significant benefits for both the expectant mother and the unborn child. It reduces anxiety and stress associated with pregnancy and positively stimulates the unborn child.

These results could have far reaching consequences; music could be used as a valuable clinical aid for detecting possible foetal alterations.

Listening to live music induces psychological and physiological changes and contributes towards the enhancement of the quality of antenatal care.

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### The effect of music, breathing and relaxation during antenatal classes

Pregnant women attending antenatal clinic have the opportunity of participating in breathing and relaxation classes which apply The Alexander technique under the supervision of a professional dancer. An actor devised the Alexander technique in the early 1900s to overcome muscular tension that impaired his stage performances. It is commonly used for inducing calm and relaxation; however its possible effect on anxiety and depression during pregnancy has not been studied.

How beneficial could be the incorporation of this activity into the curriculum of antenatal classes? To address this question a protocol was designed to investigate whether breathing and relaxation classes accompanied by music were able to influence the levels of anxiety and depression in pregnant women.

#### Protocol

The levels of anxiety and depression were measured using the Hospital Anxiety and Depression Scale (1).

An adapted version of the specially designed evaluation was used to determine how participants valued this activity, the changes they experienced and their appreciation of the hospital environment.

This programme attracted a great deal of interest and groups of 12 to 14 women were formed per session. Each participant was invited to score on the scale of the anxiety and depression test at two different points: on arrival and at the end of the class.

- baseline for comparison: the data obtained on arrival
- second set of data: changes registered after an hour of breathing, relaxation and music
- a total of 75 pregnant women completed both parts of the evaluation
- a database was constructed and statistically analysed (see Appendix)

## Results

The results showed very strong evidence that both anxiety and depression levels were significantly lower after the breathing and relaxation with music session compared to the levels on arrival to the class.

Eighty two percent of participants judged their experience as being very interesting and enjoyable and 76% recognised that the session helped to calm their worries. Eighty three percent showed a change in mood for the better.

It was also found that 93.5% of the participants had noticed the display of visual arts in their way to the class, and 73% responded that they have enjoyed them very much; 58.3% found that visual arts greatly helped them to distract from immediate worries or medical problems. Eighty five percent found that the particular environment of the hospital had changed their mood for the better, whilst easing their stress levels and 97% agreed that the integration of architecture, light and visual arts created a very pleasant environment.

The value of the work of Chelsea and Westminster Hospital Arts was highly appreciated by 88%, and 82% considered that the arts play a very important role in healing.

## Conclusions

It is very important to emphasise the relevance of these findings considering the physiological repercussion that anxiety and stress can have during pregnancy. Anxiety and stress are known to trigger the release of certain hormones which elevation can have unwanted consequences. Research studies found that intense anxiety, depression and stress decrease placental blood flow inducing foetal distress, and in some cases, could lead to the initiation of pre-term labour (2).

The evidence provided by this research supports the use of music, breathing and movement as therapeutic tools in antenatal care which could have far reaching consequences such as improving clinical outcomes at the time of birth.

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## The effect of live music on pregnant women attending the High-Risk Antenatal Clinic

This research project established another protocol to explore whether live music could induce physiological changes of clinical significance on a group of pregnant women with high levels of blood pressure.

Pregnant women attending the high-risk clinic develop intense anxiety and stress while waiting for their appointments which is reflected in the elevated levels of blood pressure measured in the consultation room. This is highly undesirable, as high blood pressure is the main reason for being in treatment.

How could the environment of the waiting room be changed in order to reduce stress and anxiety and consequently diminish the risk of a high peak of blood pressure? A special protocol was designed.

### Protocol

The research explored the distribution of the levels of blood pressure in two groups of pregnant women attending the same clinic.

- ❑ control group consisted of patients waiting for their appointments in absence of live music
- ❑ study group was formed by pregnant women waiting for their appointments in the presence of live music
- ❑ data was retrieved from the notes of the patients attending the clinic the same day of the week, treated by the same medical staff and waiting in the same area
- ❑ One or two musicians were placed in one corner of the room. The chairs for the patients were arranged in a semicircle to increase the sense of a special occasion
- ❑ A database was created entering the data from the two groups of the measurements of systolic and diastolic levels of blood pressure
- ❑ Statistical analysis of the results can be found in the Appendix

The acoustic of the waiting room was far from ideal and some instruments sounded far too loud or inappropriate; the violoncello was not welcomed; patients and staff preferred harp, clarinet or guitar.

### Results

The accurate measurements of systolic and diastolic blood pressure were taken by the clinician and later retrieved from the notes of the patients. The results showed that systolic blood pressure was 3.5mmHg lower and diastolic blood pressure was 2.3 mmHg lower in the group of women

waiting for their appointments whilst listening to live music, compared to those patients who waited in absence of music. The control group includes 34 patients and 54 patients the study group.

The effect of music on the levels of blood pressure has been extensively studied using recorded music in different clinical situations. There are obviously a number of areas in a hospital which are not suitable for the introduction of live music. Studies found that the perceived stress of ambulatory surgery in elderly patients is associated with a clinical increase in blood pressure. Patients were encouraged to listen to self-selected music by the use of headphones during the preoperative period, and the results showed a significant reduction on the levels of blood pressure compared to those patients who did not listen to music (1). Recorded self-selected music was also found very effective in reducing significantly the level of systolic blood pressure in patients undergoing cerebral angiography (2).

### Conclusions

The results of this study indicate a reduction of both systolic and diastolic blood pressure in patients waiting for their appointments in the presence of live music. These are outcomes of clinical significance, even though they were not statistically significant due to the size of the sample. For reasons beyond our control we were unable to gather data from a larger number of patients in this area of research. It would be very important to encourage a more extensive research involving a larger number of patients in a randomised study.

The evidence of this research supports the hypothesis that live music induces physiological changes which could have clinical significance. Music is a valuable addition to the list of therapeutic aids allowing pleasant and cost-effective treatments.

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## Maternity Unit

### The Effect of Visual Art in the Labour and Delivery Room

The maternity service was one of the areas selected for exploring whether the introduction of visual art can induce physiological changes of clinical significance on women in labour, and also potentially achieve lowering costs in the NHS.

The vast literature regarding the psychological and emotional needs of women in labour have identified issues such as fear of loss of control, fear of pain, insufficient obstetric care, own death or the death of the child, as the causes for extreme anxiety (1). Women in labour need empathy, help and above all support (2, 3). There are at least ten randomised controlled studies which include more than 3,000 women, examining the impact of having professional and continuous support during childbirth; the results are very consistent and showed that this intervention induces a reduction in the use of analgesia and in the number of caesarean sections (4).

Other studies explored the use of recorded music during childbirth. The findings indicate the capacity of music in alleviating stress, anxiety and pain leading to a reduction in the use of drugs and analgesics (5, 6).

The contribution of the visual arts has not been evaluated. This research project addressed the issue and designed a protocol to answer the following questions:

- Could be possible to improve the process of labour by the intervention of visual art?
- Could visual art help in reducing the requirement for epidural anaesthesia?

The rationale of the protocol resides in the basic understanding of the different stages of labour and the hormonal changes involved in the process in conjunction with the emotional needs of the mother. A normal delivery needs to achieve the right hormonal balance through the release of certain types of hormones, such as oxytocin which is naturally produced by the primitive area of the brain, and the inhibition of others which are produced by cortical areas involved in rational thinking. Anxiety and fears should be avoided (7).

The exchange of ideas with clinicians, midwives and managers of the maternity unit led to the identification of two measurements which are crucial for achieving optimal outcomes during labour and delivery. They are:

- length of labour
- frequency of requirement for analgesia

The duration of labour has a psychological and clinical impact on mothers, babies and carers; after six hours in labour a progressive deterioration of morale is noticeable and the incidence of medical complications affecting mothers and foetus is higher (7).

This research focused the efforts in changing the clinical appearance of the labour and delivery room without interfering with the medical equipment. It was decided to design a piece of artwork which could have the dual effect of reducing women's anxieties and fears thus diminishing requirements for analgesia, and act as a focal point of attention and distraction during labour.

The reduction on the use of analgesia induces immediate benefits for the mother and baby. The guidelines issued in maternity units give the mother the right to request the application of epidural anaesthesia. This decision is made after receiving qualified advice on the effects that the use of analgesia could have in the length of labour and on the possible effects on the unborn child (7). It also could help to diminish the amount of drugs used by the unit.

The transformation of the labour and delivery room also aimed to distract the attention of the mother and to screen-off the medical equipment which is highly visible and include tubes, pipes, wires, baby resuscitation table and emergency equipment.

It was decided that the installation of a specially designed screen could satisfy both issues, a) distracting the attention of the woman by focusing on an external object which should not require intellectual involvement, and b) screening off the medical equipment helping to reduce fears and stress.

The design and implementation of the screen was commissioned to Jane Duncan who in her capacity as an artist and research assistant to the research project was ideally positioned to develop this idea further. Previous research related to colour and designs for the Hydrotherapy Unit had identified the effect of appropriate colour and design in the environment (8). According to anecdotal information, expectant mothers either preferred a variety of earthly warm colours, such as reds and oranges, or aquatic related colours like blues and greens. A study by Mikellides, concluded that 'the chromatic strength of a colour is the key dimension affecting how exciting or calming is perceived and not the dimension of the hue as was previously thought by design manuals' (9). And Morris add, 'the discovery of cortical neurones that rapidly react to the emotion of an image suggests that human beings might extract the emotional significance of visual stimuli before they consciously see or feel the associated emotion' (10).

The screen for the labour and delivery room was designed taking into consideration the need for a practical structure, which also has to be durable, hygienic and portable, as well as visually stimulating and aesthetically pleasing. The process of developing the screen involved:

- ❑ the consideration of the frame structure
- ❑ the selection of the materials
- ❑ the selection of colours.

All these aspects are of a vital importance for any artist who is designing artwork for healthcare environments; particular consideration should always be given to the appropriateness of the designs and colours within the context of the clinical environment and the users of this space.

A curved outer frame structure was designed in Ash wood, it was hinged in the centre in order to be easily folded away and was supported by metal wheels at the base to facilitate easy portage. A natural material, Marmolium<sup>®1</sup> which is made from Linseed and produced in a variety of Colours were chosen to create the designs. Fourteen colours were selected. The colour palette was grouped into two ranges, warm red/oranges for one side of the screen and cool greens and blues on the other, reflecting the contrasts in nature, such as the warmth of the sky during sun-set and the cool flowing movement of water. Abstract designs were the most appropriate in this context as they allowed for an open interpretation by the viewer. As Kandinsky said 'We must find, therefore, a form of expression which excludes the fable and yet does not restrict the free working of colour in any way. The forms, movement, and colours, which we borrow from nature, must produce no outward effect nor be associated with external objects. The more obvious is the separation from nature, the more likely is the inner meaning to be pure and unhampered' (11).

### Protocol

With the full collaboration of the staff in the maternity unit one of the labour and delivery rooms was assigned for the study.

A special table was designed and held outside the door of the selected room. The midwives using this labour and delivery room recorded:

- ❑ the woman's time of entry in the room - this time point marked the beginning of labour
- ❑ the time of delivery - the end point of labour
- ❑ the type of analgesia required
- ❑ whether it was a normal delivery

Those cases that suffered medical complications were omitted from this research to avoid any bias due to clinical intervention.

Two groups were established:

- control group, formed by women giving birth in the unchanged room; lasted three months
- study group, formed by women giving birth having the designed screen in the room; another three months
- Data was retrieved from the tables, entered into a database and analysed statistically.

No other variable was introduced to the routine of the room other than the installation of the screen.

### Results

The data was retrieved from 32 women of the control group, and from 26 women in the study group.

Length of labour is defined in this research study as the time recorded on entry to the labour and delivery room and the recorded time of delivery.

A statistical test known as unpaired t-test was used to determine whether there was any difference in the length of labour recorded from women giving birth in the unchanged room compared to those who gave birth after the installation of the screen.

The results showed a shortening of the duration of labour by a significant and much welcomed 2.1 hours. The control group showed an average of 7 hours of labour whilst the mean for the study group was 4.8 hours. This result was statistically significant.

This is a clear evidence of the importance of introducing in the labour and delivery room appropriate visual art with the dual function of distracting the woman in labour and blocking the view of clinical equipment.

The frequency of requests for epidural analgesia was 7% lower in the study group than in the control group. The analysis of this data used another type of statistical test, namely the comparison of the two independent proportions. This decrease did not reach statistical significance due to the size of the sample; indeed, the computer programme predicted that a sample of 800 to 1000 mothers in each group is needed for achieving significant difference. For full details of the data and statistical analysis see Appendix.

### Conclusions

This research identified the value of visual art intervention in a labour and delivery room. It provides a focus of attention of the woman in labour on an external object, aids the midwife in giving support by using the design of the screen as a guide, and diminishes fears and anxiety by hiding clinical equipment.

The significant clinical outcomes of this research provide the evidence of the value of integrating visual art into the environment of a labour and delivery room. This integration facilitates physiological changes which have clinical significance, benefits women and babies by shortening the length of labour and diminishing the frequency of requirement for analgesia. It also improves the quality of the maternity service and potentially could deliver cost savings benefits.

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Footnote 1: The commission for the screen was entirely sponsored by Marmolium®

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## The effect of live music in the post-natal ward

Joy, happiness, fears anxiety, depression, and sadness are some of the emotions arising in women who have giving birth (1). The post-natal ward has the unavoidable task of managing a very sensitive area. Its complexity became apparent throughout our extensive consultation with senior managers responsible for the post-natal ward who identified anxiety and depression as the areas of major concern.

Chelsea and Westminster Hospital Arts programmed a cycle of weekly live performances of soothing, but joyful music. The musicians - guitarists, accordionists, and string or wind quartets - were briefed in advance on the objectives of this research and in all the considerations when playing live music in this area. They were located at the back of the main corridor in such a way that the music reached rooms and open bays without compromising privacy.

### Protocol

Levels of anxiety and depression in post-natal women were measured at two points:

- ❑ Before: willing participants were invited to complete the Hospital Anxiety and Depression Scale (2) half an hour before the arrival of the musicians;
- ❑ musicians played for half an hour or more, depending of the conditions of the ward at the time;
- ❑ After: participants completed the same test again half an hour after the music ended
- ❑ The design of this protocol allowed for each mother to be its own control. The data obtained before the live music session was compared to that obtained after the programme ended.
- ❑ This protocol was repeated once a week and lasted for three months. Throughout this time the only variable introduced into the routine of the ward was live music.
- ❑ Participants completed an evaluation form after the performance assessing: enjoyment, help to distract from worries, easing stress, change of mood for the better, value of the arts in health care.

### Results

Live music transformed the atmosphere of the post-natal ward. The response of most of the mothers and their visitors, as well as the staff, was very positive. They welcomed this unexpected

experience and encouraged many of the new fathers to bring the babies close to the musicians, thoroughly enjoying the occasion. However, some families considered the presence of outsiders in the ward as an intrusion into their privacy.

The choice of musical instruments, the number of musicians, the type of music and the programme were carefully considered; the staff were informed a day in advance, giving them the opportunity to express any possible concerns. They suggested that the best time for introducing live music was mid-morning, when it is recognised that peaks of high depression occur in the ward; ideally, live music should also be played in the early evening, a time when depression is also detected.

The database was constructed with the data from 55 mothers who completed both forms - before and after the programme of live music.

The statistical analysis showed that listening to live music significantly lowered the levels of anxiety and depression of women in the post-natal ward.

Participants scored highly in the scales of an evaluation form when asked for their responses to the event. The evaluation of issues such as interest and enjoyment, distraction from worries, easing stress and changing their mood for the better showed a very positive response.

### Conclusions

These findings provide the evidence on how the power of live music can transform a stressful environment inducing positive changes in psychological outcomes which benefit mothers and babies. The effect cascades to partners and relatives and creates better working conditions for the staff.

This contribution should motivate others to introduce live music as an integral part of the post-natal ward environment.

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## SURGICAL DIRECTORATE

### DAY SURGERY UNIT and TRAUMA AND ORTHOPAEDICS WARD

#### Background

The psychological and emotional reaction of patients facing surgery has recently been extensively reviewed (1). Medical and nursing staff play a crucial role in informing patients about the nature of the intervention and the expectations of its outcomes, but they also have to understand the fears that a surgical intervention brings about, such as the prospect of post-operative pain, possible complications, or even death. There are rigorous studies done in relation to the psychological preparation of patients for surgery, which highlight the importance of gender, age and previous experiences (2, 3). The overall findings indicate that young female patients with no previous experience developed greater levels of anxiety than older people. Patients listening to tape-recorded music during the preoperative stages showed a significant reduction in their levels of anxiety, which had positive clinical outcomes such as normalising heart rate and blood pressure (4, 5, 6). The use of visual images or guided imagery was also effective in reducing preoperative anxiety and was found to increase patients' satisfaction (7).

Based on the findings of the medical literature, this research investigated whether the integration of visual arts and live performances into the health care environment plays a role in creating the best conditions for achieving beneficial clinical outcomes. The focus of this study concentrated on the two main phases of the process:

- the preoperative preparation of patients carried out in the Day Surgery Unit and
- the postoperative period studied in the Trauma and Orthopaedics Ward

This research was enthusiastically received and widely supported by medical, nursing and managerial staff of the two units selected.

During the preoperative preparation of the patient the main question to answer was:

- Could the integration of the arts into the clinical environment induce physiological changes which could have clinical significance, and also influence the amount of drugs used during induction prior to anaesthesia?

The investigation of the effect of the arts in the postoperative period posed different questions:

- Could it have any effect in controlling postoperative pain and consequently diminish the consumption of analgesics?
- Could the integration of the arts into the health care environment accelerate recovery, shortening the length of stay in hospital?

The answers to these questions are very important for both patients and management. Reducing the stay in hospital could have immediate repercussions in activating the waiting list for elective surgery, and diminishing the consumption of drugs could bring cost-effective benefits.

### Day Surgery Unit - Preoperative Preparation

An optimal preoperative preparation of the patient for a surgical intervention is of utmost importance for a successful outcome. One particular type of procedure was selected for this study: a gynaecological procedure for the removal of pre-cancerous cells from the womb – this offers, from the point of view of patient management, a consistent routine; it takes place once a

30 minutes while preparation for the intervention takes place elsewhere. The next stage is the transfer of the patient to the anaesthetic room where blood pressure and heart rate are recorded again. The anaesthetist proceeds to administer drugs to induce anaesthesia. The operation lasts around 20 minutes and the patient is then transferred to the recovery room. The patient completes his recovery in the cubicle before being discharged. No variable was introduced at any time; patients used the same waiting room, the same two cubicles which were allocated for the research and the same anaesthetic and recovery rooms.

The protocol was devised in order to obtain the data after each stage of the process:

- on arrival to the waiting room,
- during the stay in the cubicle,
- in the anaesthetic room,
- before the patient was discharged.

Two groups of patients were established:

- control group: subjects who underwent preparation in the absence of visual art and/or live music. Data was collected during three months
- study group: patients undergoing the same preparation, but in the presence of visual art and /or live music. Data was gathered during a period of three months

The first phase was completed after the staff of Chelsea and Westminster Hospital Arts removed all existing pictures from the walls of the unit and covered the paintings on the ceiling and above the door in the anaesthetic room. For the second phase, they removed the covers, reinstalled the pictures and added a display of black and white photographs around the three walls of the cubicles. They also provided live music which was performed by a musician - a guitarist sitting in one corner of the waiting room.

### Measurements

- salivary levels of cortisol, a neuroendocrine hormone, as a measure of stress,
- salivary secretory immunoglobulin A (S-IgA) as an indicator of the state of the secretory immune system,
- levels of blood pressure and heart rate; the recorded data was retrieved from the patient's notes after measurements in the cubicle and in the anaesthetic room,
- amount of induction agents used prior to anaesthesia.

Cortisol and S-IgA tests were performed on saliva samples collected using a commercial collection device (salivettes), and carried out in collaboration with specialists at Westminster University. The assessment of cortisol in saliva has been recognised as a valid and reliable

measurement of this hormone and provides an easy and non-invasive method of choice for the collection of samples. There is a comprehensive review of this subject (8) that can be consulted by the interested reader. The assessment of cortisol status has important physiological and psychological implications. It is important to emphasise that the levels of this hormone vary throughout the day. It has been established that the secretory activity increases after waking to reach a peak in the morning and it falls thereafter over the remainder of the day (9, 10).

Salivary immunoglobulin A (S-IgA) is a product of a subset of lymphocytes (white blood cells) called B-cells, which can be used, when measured in saliva, as an indicator of the status of the secretory mucosal immune system. Its decrease may be a risk factor in the development of some type of infections. Interestingly, there are a number of studies suggesting that S-IgA is also a useful indicator of mood and stress levels. The measurement of both cortisol and IgA in cancer patients who had sessions of music therapy showed a decrease in cortisol levels and an increase in S- IgA. This effect lasted for two days (11). This indicates the benefit of introducing music as a therapeutic tool.

The protocol implemented takes into account the diurnal variations in cortisol levels, and therefore demanded the collection of four saliva samples at different stages of the preoperative process:

- ❑ first sample shortly after patient's arrival (average of 10 minutes in the waiting room,)
  - ❑ second sample at entry into the cubicle,
  - ❑ third sample after 20 minutes in the cubicle,
  - ❑ fourth sample taken in the anaesthetic room before the induction of anaesthesia.
- 
- ❑ All samples were kept frozen at  $-70^{\circ}\text{C}$  until they were analysed in the laboratories at Westminster University.
  - ❑ The amount of induction agents and weight of the patient were recorded for each patient.  
The amount of induction drugs needed prior to anaesthesia is expressed as amount of drug used per kilogram of patient's weight.
  - ❑ A specially designed questionnaire was completed by the patient before being discharged

Psychological changes were analysed comparing the data obtained from patients in the control group to that of the study group. The designed short questionnaire (enclosed) covers the self-

assessment of patients' level of anxiety throughout the day at the clinic. They scored in a pre-established scale 1 to 10 (being 1 the lowest) and the data was analysed statistically.

## Results

The results showed that patients in the study group had lower levels of systolic and diastolic blood pressure, and a normal heart rate compared to the levels found in the control group.

Even more important was the finding that these vital signs - blood pressure and heart rate - were significantly lower in patients in the study group than in the control group, when these measurements were taken in the anaesthetic room. The systolic blood pressure of patients exposed to visual arts and live music was 28.0mmHg lower than in the control group.

This dramatic effect had an immediate repercussion on the amount of induction agents needed prior to anaesthesia. The dose of induction agent required to induce anaesthesia in patients in the study group was 0.83mg/kg less than in the control group. This difference was statistically significant.

Biological changes of clinical significance were found when analysing the salivary levels of cortisol in 14 patients (8 in control group and 6 in the study group) at four time-points during their stay in Day Surgery. The levels of cortisol in patients waiting for their operation in the presence of visual arts and live music were lower throughout the day compared to the levels found in patients in the control group. In spite of finding that the levels of cortisol had decreased in both groups during their time in hospital, the average amount of salivary cortisol was 48% lower in the study group than in the control group. This difference was statistically significant.

The difference in the baseline values - first sample - between study and control group could be due to seasonal influences; the control group was tested during winter and the trial group in spring. Or it could be due to chance, considering the small number of patients tested in each group. However, the lower starting value of cortisol in the study group seems to be a direct response to the introduction of visual art and live music into the environment. Indeed, patients in the study group were exposed to both stimuli for an average of 10 minutes before the first salivary sample was collected. The display of visual art, including an interesting picture in the reception area, and the presence of a musician playing soothing tunes in the waiting room, contributes to the alleviation of anticipatory stress associated with surgery, and it might explain the immediate lowering effect of cortisol levels.

There was no statistically significant difference between the concentrations of S-IgA measured in the two groups at different time points. This could be due to the large variation found between individuals. A larger number of patients is required.

The statistical analysis of the database constructed with the data from the questionnaires showed that anxiety levels in the study group were lower than in the control group. The difference was statistically significant at the time-point of the patient waiting in the cubicle. Their anxiety scores were 2.84 lower than those of the control group, emphasising the value of engaging the attention of the patient at a very stressful time. For full details of the data and statistical analysis see Appendix.

### Conclusions

The evidence accumulated throughout this study strongly suggests that visual and performing arts could play a therapeutic role during the pre-operative period. The arts integrated into the clinical environment significantly diminished the levels of anxiety, and induced physiological and biological changes which have clinical value. The levels of blood pressure, heart rate and cortisol were lower in the group of patients exposed to visual arts and live music.

This research also found a reduction in the amount of induction drugs needed prior to anaesthesia in those patients who had their preoperative preparation in the presence of visual and performing arts. This integration brings benefits to the patient and could have budget implications for the NHS.

It would be interesting to investigate further whether preoperative preparation of the patient in the optimum conditions described in this study could have an effect on the incidence of possible complications after surgery and on the length of recovery.

### The effect of visual and performing arts in the postoperative period - Trauma and Orthopaedic Ward

This study explored the effect of the integration of visual art and live music into the ward environment on the postoperative process. The interest of the medical staff in finding new elements for improving the clinical outcome of patients undergoing hip or knee replacement operations, and enhancing the efficiency of the service, led us to establish a research unit on the Trauma and Orthopaedic ward.

This research aimed to find out whether the integration of visual arts and live music in the ward environment could have an impact on the consumption of analgesics during the postoperative period and on the length of stay in hospital.

The choice of these measurements is undoubtedly of great importance. A reduction in both or even in either of the two could have a number of implications. Shortening the length of stay in hospital could increase the number of elective operations and have repercussions for waiting lists. Reduction in the amount of analgesics could contribute to cost savings.

### Protocol

After the approval of the Ethics Committee the data was retrieved from the notes of patients who were in the postoperative period following knee or hip replacement. Patients were in the presence of visual arts from the time of the operation, having paintings on the ceiling and above the door in the anaesthetic room and also on the walls of the ward. The programme included twice weekly sessions of live music. During the time of collecting data from patients in the control group, paintings were covered or removed and no music was played.

Two groups were formed:

- control group: patients in postoperative period in the absence of visual arts and/or live music;
- study group: patients in postoperative period in presence of visual arts and/or live music

### Measurements:

- the amount of analgesics consumed daily by each patient;
- length of stay in hospital after the operation.
- All data was entered in a database and analysed statistically

### Results

The results of this research are very encouraging. The statistical analysis of the data on the daily consumption of analgesics showed that patients in the study group consumed 69mg fewer analgesics per day than the control group.

This clinically important outcome did not reach statistical significance. This could possibly be due to the small size of the sample; however, we should not underestimate the relevance that this finding could have to patient management and potential savings for the NHS.

Another very important measurement taken in this study was the length of stay in hospital after elective knee or hip replacement surgery. The result obtained analysing the data from 23 patients in the control group and 22 patients in the study group has shown that the latter recovered faster than patients in the control group. The statistical analysis of the accumulated data showed that the postoperative time of patients recovering in an environment which was transformed by the display of visual art in conjunction with an engaging programme of live music was reduced by one day compared to the length of stay of patients in the control group. For full details of the data and statistical analysis see Appendix.

### Conclusions

The findings of this study open up new avenues; it would be important to investigate whether the reduction in the intake of analgesics correlates with the day and time in which the patients are entertained by live music. The benefits of live music might be accentuated if the research were extended to highlight issues such as the identification of the type of music and indeed the type of instrument that patients in postoperative situations are more likely to respond to. It would be very interesting to explore the individual contribution of visual arts and that of live music in inducing changes of clinical significance. There is no doubt that the answers to these and other questions can only be achieved with randomised studies executed on a large number of patients.

Prediction analysis done by computer applying a formula with the data obtained in this study showed that a total of 50 patients in each group are needed to detect significant differences. The shortage in the size of the sample in this investigation was due to unforeseen circumstances, such as reduced number of appointments for elective operations and changes in medical staff, which brought about different approaches to patient management and prompted our decision to terminate the research.

These facts, however, do not invalidate the relevance of the findings, which provides the evidence for the importance that integrating the arts into the clinical environment has as a therapeutic tool leading to outcomes of clinical and managerial significance. A clinical environment offering interesting and attractive visual arts and a programme of live music contributes to shortening the length of stay in hospital and significantly reduces the consumption of analgesics.

These findings could have an effect on the management of elective operations with potential repercussions in reducing waiting lists; implications such as cost benefits derived from a

reduction in drugs consumption, and increased patient and staff satisfaction as a result of the enhancement of the quality of the service.

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## HIV/AIDS Unit

The St Stephen's Centre at Chelsea and Westminster Hospital is one of the leading centres of excellence in Europe for clinical care and research in HIV/AIDS, and is constantly pioneering new models of care and treatment for people with HIV.

Perhaps it seems rather strange to ask whether live music could influence physiological outcomes in patients affected by the condition known as Acquired Immunodeficiency Syndrome or AIDS. It was established with the full collaboration of the Clinical Research Director of St Stephen's Centre and his team. After holding discussions about the appropriate measurements to be followed in this research, it was agreed to establish a protocol to investigate changes in blood cell counts after the patient attended a session of live music. The clinicians were actively involved in clinically assessing those patients potentially able to participate in this study and in collecting the blood samples needed for the research.

This study was based on the basic understanding of the nature of the immune responses elicited in patients infected with the HIV virus (Human Immunodeficiency Virus), and on the need to explore new approaches to complement drug treatment and improve patients' quality of life.

What was the rationale behind this research? Every viral infection induces a response of the immune system. In addition to the production of antibodies, HIV infection elicits also a cellular immune response. Basically, there are two broad categories of the cells called lymphocytes; B lymphocytes that are antibody-producing cell, and T lymphocytes which are involved in cell-mediated immunity. Within the T lymphocyte category, a number of different subsets can be distinguished. One subset is called CD4 lymphocyte or helper cell which enhances the immune response through the production of active molecules or cytokines; another subset is known as CD8 lymphocytes which function as a killer cell destroying those cells infected by the virus. Once the individual is infected, the HIV virus gains entry to the CD4 cells and leads, without intervention, to a progressive loss in the number of cells of this subset and an initial increase in the numbers of CD8 lymphocytes or killer cells.

### Protocol

This research aimed to explore possible physiological outcomes that an hour of relaxation, distraction and enjoyment provided by attending a live performance, could have on patients' levels of CD4 and CD8 lymphocytes.

The hospital's Ethics Committee approved the protocol, which was implemented following a very rigorous routine; the clinicians had the monthly live performance programme in advance, enabling the team to set up the conditions for carrying out the research. After the clinicians performed a clinical assessment of hospitalised patients, the list of nominated patients was sent to us one day before the concert; we randomised the names of the patients, thus ensuring that no bias was introduced when dividing the patients into two groups:

- control group formed by patients who remain in the ward at the time of the live performance;
- study group integrated by patients who attended the concert
- live music was performed in the public area of the hospital's ground floor, and did not reach patient's in the second floor ward which looked after patients with HIV;
- the consent of the patient was requested before being included in the study;
- one hour before the music started, the clinicians collected a blood sample from each patient in both the control and the study groups;
- a second blood sample was taken within an hour after the concert had ended;
- the two blood samples from each subject were analysed in the hospital's laboratory.

### Measurements

- to establish the number of CD4 and CD8 lymphocyte cells per  $\text{mm}^3$ ;
- the percentage of each subset in relation to the total number of lymphocytes.
- The data was entered into a special database and analysed statistically. Full details of the statistical tests applied can be found in The Appendix.

### Results

The results showed that there were no differences in the number of CD4 cells/ $\text{mm}^3$  before and after the concert in either of the two groups of patients.

Interestingly, however, live performances appear to have an effect on CD8 lymphocytes or killer cells. The number of this type of cell was higher in the blood sample taken after the patient was exposed to music than in the first sample, whereas in the control group the number of CD8 cells in the first and second blood samples remained unchanged.

The clinical significance of this finding is difficult to assess for two main reasons: a) although the total number of killer cells had increased in those patients who experienced live music, the percentage of this subset in relation to the total number of white cells did not change, and b) because it is difficult to draw definitive conclusions due to the small number of patients tested.

Initially, this study aimed to recruit 30 to 40 patients. The complexity of the clinic, including unforeseen problems with staff resources in taking blood samples, and the nature of the disease

that can unpredictably incapacitate some patients to move from the ward reduced the total number studied to 17 patients. In spite of patients' willingness to come from the ward to the ground floor where the concert was taking place, some patients felt unwell before the event or might have fallen asleep. Some patients changed their minds about participating, even after having signed the consent form.

The debate on the efficacy of complementary therapies for HIV/AIDS patients has been extensively reported (1), including the pioneering work at Chelsea and Westminster Hospital (2). They include diet, massage and acupuncture. Complementary therapies do not attempt to either cure or stop the progress of the disease but they could play a role in helping to diminish patients' stress and fear, increasing the chances of a better immune response and to maintain a healthy way of living (3, 4). This therapy used in combination with conventional drug therapy did not induce changes in the levels of CD4 cells, a result which is in line with our own findings.

### Conclusions

The results of this research indicating that physiological changes such as increased number of a particular subset of lymphocytes may be detected in patients who were exposed to one hour of live music, opening the scope for more extensive research. It would be of great importance for HIV/AIDS services to understand and evaluate the psychological and biological effects of integrating a programme of visual arts and live performances into both the outpatients clinic and the ward.

The crucial questions regarding the long-term effect that the arts could have on measurable clinical outcomes in a large number of cases are waiting to be answered. Only by assuring the right level of resources for this type of research could one provide further evidence for the benefit to both patients and the quality of healthcare services.

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### STAFF EVALUATION

How can health care services provide healthy, stimulating, functional and attractive environments addressing the needs of patients, the concerns of carers and working conditions for staff?

No one would under-estimate the scale and importance of this task which can only be fulfilled through interdisciplinary co-operation. Health authorities and investors, the medical and nursing professions, managers, architects, designers and arts administrators are some of the main players in the process. A recent study indicates: 'It is now widely acknowledged that the design of the environment has the capacity to enhance healing by reducing stress and raising staff morale' (1). Design and environment are important issues in health, and inspired a number of architects to develop new strategies for creating healthier spaces. In the early seventies there were critical studies of the importance of having windows in every hospital room, to link patients and staff to the outside world (2, 3). The existence of a windowless intensive therapy unit in the Norfolk and Norwich Hospital (since removed) prompted a study in 1980, which showed that it had effects of clinical importance. Patients treated in windowless rooms presented loss of accurate memory and disorientation and required a longer stay in hospital compared with those patients with similar clinical conditions who received medical attention in environments with natural light and interesting views from a well-positioned window (4). Another study reported that patients recovering from a particular type of operation in a room with windows overlooking gardens spent less time in hospital and required fewer analgesics than patients in windowless rooms (5).

The growing interest and the need to understand these issues has been recognised by the British National Health Service which in 1999 commissioned research to investigate and quantify the effects of the architectural environment in health care on patients outcomes. This interesting study concluded after evaluating the responses of patients who had being moved from an old hospital building to a new building that they significantly favoured the new location. Patients also felt that they had received better treatment and assistance from the medical staff even though they were actually the same in both buildings. A new purpose built hospital helped to

increase overall patients' satisfaction levels. Equally important, the study provided evidence that particular architectural features - including improved design, lighting, temperature and noise levels - in two other hospitals (Poole and Brighton) led to a reduction of 1.5 days in the length of stay in hospital of some patients, as well as in the amount of analgesia given. This calmer, less hostile environment had a similarly dramatic effect in the length of time that mental patients at the Brighton hospital needed to spend in seclusion; the authors reported a significant 70% reduction.

These outcomes are undoubtedly related to how patients perceive the care they receive, and contribute to reducing the demands on staff while increasing job satisfaction.

The literature reports the medical and social benefits of thoughtful health care design combined with cultural interventions such as visual and performing arts, story-telling and literature, in enhancing the wellbeing and quality of life of patients, staff and visitors in hospital environments (7). Researchers in Sweden extended the investigation in a randomised study of more than 1,500 people and found that those who attended various types of cultural events as part of their way of life showed beneficial effects on longevity and other health-related measurements, such as blood pressure and beneficial hormonal releases. The authors attributed these results to the stimulation of the brain and its interaction with the immune system by the arts (8, 9).

Staff morale can be increased if the employer is prepared to offer a supportive, lively and creative working environment. There are a number of sociological and psychological studies showing the beneficial influence of music, visual arts and colour as behaviour modifiers (10). However, evidence of the vital role that the arts could play in achieving these objectives within the health care environment has been mainly anecdotal or qualitative.

This study carried out a pilot quantitative survey of hospital staff of how the environment - architecture, lighting, colour, works of art and live performances - contributes to:

- ❑ the reduction of stress levels,
- ❑ change their mood for the better,
- ❑ reveal preference for working in a modern or traditional hospital,
- ❑ influencing their decision to apply for a job at the Chelsea and Westminster hospital and
- ❑ remaining in their current job.

## Protocol

The questions were presented to all hospital staff using an adaptation of the evaluation form previously used to evaluate the effects of the visual and performing arts on patients, staff and visitors.

- ❑ evaluation forms were distributed in collaboration with the hospital finance department who included them in the staff's pay slips
- ❑ staff scored in a pre-established scale of 1-10
- ❑ data was entered into a specially constructed database
- ❑ statistical analysis was applied

## Results

The evaluation forms were completed by 20% of the staff distributed as follows: 62 clinicians (20%), 129 nurses (40%), 12 scientists and auxiliaries (11.6%), 20 managers (6.15%), and 73 administrators (22.25%). This return was similar to previous surveys carried out by the hospital's human resources department.

The results showed that 60% of staff recognised that the particular environment of this hospital helps to reduce stress levels, and to change their mood for the better (76.5%); 90% agreed that the integration of visual and performing arts made for a very pleasant working environment. The results showed a decided preference for working in a modern hospital (60%).

Job satisfaction, staff recruitment and retention are crucial issues for the National Health Service, the largest employer in Britain and indeed in Europe. This is a complex aspect, which has many contributing factors such as the influence of training (11) supervision (12), location and environment.

This study explored staff attitudes towards the hospital environment and how it might influence their decision to remain in their current job. The results showed that for 43% of respondents it was an issue of high importance, and for 23.5% of moderate concern (mid-scale response). The responses also indicated that for 66% of prospective applicants, the environment was either of high or moderate importance in selecting their place of work.

A statistical test was applied to establish a comparison between the responses of clinicians and nurses. Interestingly, this study showed that they have very similar opinions on these important aspects of their day-to-day working life. The particular environment of this hospital eased their

stress levels: clinicians 75%, nurses 60%, and contributed greatly towards a positive change in mood, in 88% of clinicians and 82% of nursing staff. For 96% of clinicians and 91% of nurses the integration of the arts into health care result in a very pleasant environment. This issue must be taken seriously - it is not an optional extra.

The role that the environment played in their decisions to apply for a job at this hospital was considered highly by 43% of clinicians and 49% of nurses. As to how the environment contributes to their decision to remain in their current job, 46% of clinicians and 53% of nurses responded that they rate this highly. Only 20% of clinicians and nurses felt that the environment is only a minor issue in applying for and/or staying in the job. There was also overwhelming support for working in a modern purpose-built building - 80% of clinicians and 85% of nurses - as opposed to traditional NHS hospitals. For a full statistical analysis see Appendix.

Data provided by the hospital human resources department correlates with these findings. They conducted their own survey in order to establish staff opinions on the quality of the working conditions. The results showed that 40% of staff recognised the importance that the environment plays in their everyday working life and 20% of the newly recruited staff declared that it was a serious consideration in their decision-making.

### Conclusions

This pilot study indicates that the majority of employees give special consideration to the working environment and they recognised that is also a contributory factor when making major decisions such as applying for or leaving the job. These results emphasise the relevance that the hospital's environment and its integration with the visual and performing arts could potentially have in the recruitment and retention of staff.

It is very important to provide a percentage of capital budgets for commissioning works of art at the planning stage of new hospitals, and to establish a permanent creative and dynamic arts programme. A health care policy that integrates architecture, design, and the visual and performing arts into a health care environment could enhance staff morale and job satisfaction, and have an impact in the recruitment and retention of staff.

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## MEDICAL DAY UNIT

### The Effect of Visual Art and Live Music in the Medical Day Unit

#### Aim:

- ❑ To determine whether the visual arts and live music have a psychological effect on patients receiving chemotherapy treatment
- ❑ To determine whether visual art and live music have an effect on the levels of anxiety and depression of patients receiving chemotherapy treatment

Size of the sample: 91 subjects. 83 completed the evaluation form (91% returns). Anxiety scores were recorded from 57 patients (63%) and depression scores from 56 patients (62%)

#### Variables:

- ❑ Respondents were divided into three groups:
  - 1) Control group, patients receiving treatment in the absence of visual or performing arts;
  - 2) Study group/live music, patients receiving treatment in the presence of live music;
  - 3) Study group/visual art, patients receiving treatment in the presence of visual art.
- ❑ Patients were invited to score on a 1 to 10 scale (low to high), to determine whether the integration of the arts into the clinical environment had any psychological effect
- ❑ The levels of anxiety and depression were measured in all groups

#### Analysis:

Table 1 Response of patients in the study/live music group (in percentages)

Question	Low range scores 1 - 4	Mid range scores 5 - 7	Upper range scores 8 - 10
Interest	5.0	27.5	67.5
Enjoyment	2.5	22.5	75.0
Help to distract	20.0	17.5	62.5
Change mood for the better	5.12	30.8	64.0

Table 2. Response of patients in the study/visual art group (in percentages)

Question	Lower range scores 1 - 4	Mid range scores 5 - 7	Upper range scores 8 - 10
Attract	7.6	16.5	76
Enjoy	8.9	12.6	78.5
Help to distract	20.3	32.9	47.0
Change mood for the better	2.64	17.0	80.3

Question	Lower range scores 1 - 4	Mid range scores 5 - 7	Upper range scores 8 - 10
Ease stress levels	8.0	27.0	65.0
Make a pleasant environment	1.0	11.65	87.34

### Measurement of the levels of anxiety and depression

Table 3. Anxiety scores

Group	n	Median (inter-quartile range)
Control	17	7.0 (3.0 , 9.0)
Study/visual arts	23	5.0 (3.0 , 7.0)
Study/live music	12	4.5 (2.0 , 7.0)

Table 4. Depression scores

Group	n	Median (inter-quartile range)
Control	16	4.0 (2.5 , 8.5)
Study/visual arts	23	3.0 (1.0 , 8.0 )
Study/live music	12	3.5 (2.0 , 4.0)

### Statistical methods:

- Regression analysis was applied to determine whether scores varied in the three groups. The control group was used as a baseline.
- A logarithmic transformation was performed on both anxiety and depression scores as the data were right skewed. This procedure ensures that the assumptions of normality and constant variance for regression analysis are met. The results were back transformed to obtain approximate ratios for the differences in mean scores, between each study group compared to the control group.

### Ratios between each study group and control group

Table 5 Comparisons for anxiety scores

Group	Ratio (95% confidence interval)	P value	Decrease (%)
Control	-	-	
Study/visual arts	0.82 (0.53 , 1.26)	0.36	18
Study/live music	0.68 (0.41 , 1.13)	0.13	32

Table 6. Comparisons for depression scores

Group	Ratio (95% confidence interval)	P value	Decrease (%)
Control	-	-	
Study/visual arts	0.66 (0.41 , 1.05)	0.08	34

Study/live music	0.69 (0.40 , 1.19)	0.18	31
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### Results:

- ❑ Anxiety levels in the study group/visual art were approximately 18% lower than in the control group. This result was not statistically significant, p=0.36
- ❑ Anxiety levels in the study group/live music were 32% lower than in the control group. This result was not statistically significant, p=0.13
- ❑ Depression levels in the study group/visual art were 34% lower than in the control group. This result was of borderline statistical significance, p=0.08
- ❑ Depression levels in the study group/live music were 31% lower than in the control group. This result was not statistically significant, p=0.18
- ❑ The reductions seen are of clinical interest. It is possible that statistical significance was not achieved due to the small numbers in each group, hence the lack of power.

### Conclusions:

- ❑ Over 60% of the respondents have evaluated the integration of the visual and performing arts into the clinical environment very highly.
- ❑ Live music appears to be more effective than visual art in lowering the levels of anxiety

## WOMEN AND CHILDREN'S DIRECTORATE ANTENATAL CLINIC

### The Effect of Live Music on the Heartbeat of the Mother and her Unborn Child

#### Aims:

- ❑ To determine whether there is a difference in the number of accelerations in the heartbeat of the foetus, with and without music.
- ❑ To determine whether there is a difference in the heartbeat of the mother, with and without music.
- ❑ To determine whether there is an association between the mother's heartbeat and the number of accelerations in the heartbeat of the unborn child.

The National Institute for Clinical Excellence (guidelines May 2001) defines accelerations as: 'Transient increases in foetal heart-rate of 15 beats per minute (bpm) or more and lasting 15 seconds or more'.

Background:

Size of the sample: 25 subjects

Variables:

- ❑ First 20 minutes - total number of accelerations in the absence of music - control baseline
- ❑ Next 20 minutes - total number of accelerations in the presence of live music
- ❑ Final 10 minutes - total number of accelerations in the absence of live music
- ❑ Mother's heartbeat/minute in the absence of live music
- ❑ Mother's heartbeat/minute in the presence of live music

Analysis:

Table 1 Heartbeat of the foetus and pulse of the mother

Variable	n	mean	Standard deviation
Number of accelerations - no music	25	3.72	2.01
Number of accelerations - with music	25	7.40	2.63
Mother's pulse - beats/minute - no music	25	79.2	9.18
Mother's pulse - beats/minute - with music	25	80.1	11.2

Statistical method:

- Paired t-test

Results:

- The number of foetus's heartbeat accelerations was 3.68 times higher following music (95% confidence interval: 1.84bpm to 5.52bpm). This result was statistically significant,  $p < 0.001$
- There was no evidence of a difference in mother's pulse before and after live music,  $p = 0.51$ ; mean difference: 0.88 bpm higher after live music (95% confidence interval: 1.84bpm lower to 3.60bpm higher)

Heartbeat of the foetus post music

A number of participants ( $n = 15$ ) had the number of accelerations measured for a further 10 minutes after the music ended.

Table 2. Heartbeat of foetus post music

Variable	n	mean	sd
Number of accelerations - no music	15	2.27	1.02

Number of accelerations - with music	15	3.17	1.38
Number of accelerations - post music	15	3.67	1.59

Statistical method:

- Paired t-test. The test was used to determine whether there was any change in accelerations after the music ended

Results:

- There was no evidence of a difference in the number of accelerations during the time with live music and after the music had ended ( $p=0.22$ ). Mean difference: 0.5 units higher after the music ended (95% confidence interval: 0.33 units lower to 1.33 units higher), indicating that the number of accelerations remained at the higher level for the 10' post music measured.

Association between mother's heartbeat and the number of accelerations in the heartbeat of the unborn child

Statistical method:

- Regression analysis was used. As measurements taken with and without live music were included in the analysis, robust standard errors were used to allow for the fact that observations were not independent.

Results:

- There was strong evidence of an association between the number of accelerations and the heart rate of the mother,  $p=0.004$ . Each acceleration increase in the heartbeat of the unborn child was associated with a 0.1beat/minute decrease in mother's pulse (95% confidence interval: 0.03 to 0.16 unit decrease).

Conclusions:

- The number of accelerations in the heartbeat of the unborn child (a sign of well-being) were significantly increased during and at least 10 minutes after the mother had listened to live music;
- There was no evidence of a difference in mother's pulse before and after music;
- There was strong evidence of an association between the number of accelerations in the heartbeat of the fetus and the heart rate of the mother.

Breathing and Relaxation Antenatal Classes

Aims:

- To determine whether there is a change in the levels of anxiety and depression of pregnant women attending the antenatal classes of breathing and relaxation using the Alexander Technique;

- To determine their assessment after participating in the class.

Size of the sample: 77 subjects

Variables:

- Participants completed the hospital scale for anxiety and depression on two occasions:
  - 1) Before participating in the class
  - 2) After participating in the class

Analysis:

Table 1. Anxiety levels

Variables	n	Median	10 <sup>th</sup> and 90 <sup>th</sup> centiles
Before the class	75	7	3 , 12
After the class	55	5	1 , 10

Table 2. Depression levels

Variables	n	Median	10 <sup>th</sup> and 90 <sup>th</sup> centiles
Before the class	75	3	1 , 8
After the class	55	1	1 , 6

Table 3. Assessment after the class

Variables	n	Median	10 <sup>th</sup> and 90 <sup>th</sup> centiles
Interest	69	8	5 , 10
Enjoyment	69	8	5 , 10
Helping to distract	69	8	4 , 10
Changing mood for the better	69	9	5 , 10

Changing mood for the worse	69	1	1 , 4
Value of the work of CWHA*	67	8	6 , 10
Role of the arts in healing	71	8	6 , 10

\* Chelsea and Westminster Hospital Arts

Statistical method:

A Wilcoxon matched pairs signed rank sum tests was used to determine whether there were changes to anxiety and depression scores following participation in the class. The test was performed on the 55 subjects who completed both time points.

Results:

- There is strong evidence that anxiety scores were lower after participating in the class. The median difference in score was 1.5 (95% confidence interval: 1 to 2). This difference was significantly different,  $p < 0.001$ ;
- Depression scores were also significantly lower after participating in the class. The median difference in scores was 1 unit (95% confidence interval: 0 to 1). This difference was significantly different,  $p = 0.003$ .

Conclusions:

- Pregnant women participating in breathing and relaxation classes assessed highly its value and benefits;
- There was strong evidence that the levels of anxiety and depression were significantly lower after participating in the class.

The Effect of Live Music in the High Risk Antenatal Clinic

Aim:

- To determine whether the introduction of live music in the waiting area of the high-risk clinic had an effect on the level of blood pressure of pregnant women attending.

Size of the sample: 88 subjects. There were 34 subjects in the control group and 54 subjects in the study group

Variables:

- The levels of systolic and diastolic blood pressure were measured at the start of the consultation in:
  - 1) Patients waiting for their appointments in the absence of live music - the control group
  - 2) Patients waiting for their appointments in the presence of live music - the study group

Analysis:

Table 1. Influence of Live Music on Blood Pressure (BP)

Variables	Mean (standard deviation)	
	No live music (n=34)	Live music (n=54)
Systolic BP (mmHg)	118 (16)	115 (13)
Diastolic BP (mmHg)	72 (11)	70 (11)

Results:

- Systolic blood pressure was 3.5mmHg lower in the study group than in the control group (95% confidence interval: 9.8mmHg to 2.9mmHg), decrease of 3%, p=0.28
- Diastolic Blood pressure was 2.3mmHg lower in the study group than in the control group (95% confidence interval: 6.9mmHg to 2.3mmHg), decrease of 3%, p=0.33

Conclusions:

- There was no statistical difference in the levels of blood pressure between those patients who listened to music while waiting for their appointments and those who did not.

The Effect of Live Music in the Postnatal Ward

Aim:

- To determine whether live music had an effect on the levels of anxiety and depression of postnatal women

Size of the sample: 55 subjects

Age: 34 (28, 44)

Variables:

- Anxiety and depression scores 30 minutes before the live music commenced
- Anxiety and depression scores 30 minutes after the live music ended
- Assessment of the effect of the live performance

Analysis:

Table 1. Levels of anxiety before and after live music in the postnatal ward

Variables	n	Median	10 <sup>th</sup> and 90 <sup>th</sup> centiles
Before live music	55	6	1 , 11
After live music	39	6	1 , 10

Table 2. Levels of depression before and after live music in the postnatal ward

Variables	n	Median	10 <sup>th</sup> and 90 <sup>th</sup> centiles
Before live music	54	3	1 , 6
After live music	38	2	1 , 7

Table 3. Assessment after live performance

Variables	n	Median	10 <sup>th</sup> and 90 <sup>th</sup> centiles
Interest	40	7	3.5 , 10
Enjoyment	40	8	4 , 10
Helping to distract	40	8	1.5 , 10
Easing stress	40	7	1.5 , 10
Changing mood for the better	40	7.5	2 , 10
Changing mood for the worse	40	1	1 , 7
Value of the work of CWHA*	39	8	5 , 10
Role of the arts in healing	39	8	5 , 10

\*Chelsea and Westminster Hospital Arts

### Statistical method

- Paired t-tests were used to determine whether there was a difference in anxiety and depression scores before and after live music

### Conclusions:

- Anxiety scores were significantly lower after the live music programme,  $p=0.005$  - mean difference 1.05 units lower (95% confidence interval: 0.35 to 1.76 units lower)
- Depression scores were significantly lower after the live music programme,  $p=0.008$  - mean difference: 0.45 units lower (95% confidence interval: 0.12 to 0.77 units lower)

## The Effect of Visual Art in the Labour and Delivery Room

### Aim:

- To determine whether the installation of a specially designed screen in the labour and delivery room had an influence on the length of labour and the requirement for epidural anaesthesia.

Size of the sample: 58 subjects. There were 32 subjects in the control group and 26 subjects in the study group

### Variables:

- Duration of labour and requirement for epidural anaesthesia in a labour and delivery room without the screen - control group;
- Duration of labour and requirement for epidural anaesthesia in a labour and delivery room with the screen - study group.

### Analysis:

Table 1. Effect on length of labour

Measurement	Mean (sd)	
	Control Group	Study Group
Length of labour	7.0 (4.9)	4.8 (3.3)

Table 2. Effect on requirement for analgesia

Measurement	Percentage	
	Control Group	Study Group

Epidural requested	53	46
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Statistical methods:

- Unpaired t-test was used to determine whether there were differences in duration of labour between the two groups. An adjustment was made for unequal variance between the groups.
- Comparison of two independent proportions was applied to determine any difference in epidural requirement between the two groups.

Results:

- Duration of labour was 2.1 hours shorter in the study group (95% confidence interval: 0.03 hours shorter to 4.3 hours longer). This result was of borderline statistical significance,  $p=0.05$ .
- The number of requests for epidural anaesthesia was 7% lower in the study group compared to the control group (95% confidence interval: 33% less to 19% more). This result was not statistically significant,  $p=0.60$

Conclusions:

- There is strong evidence that the installation of a specially designed screen in the labour and delivery room had the effect of shortening the duration of labour and diminishing the requirement for epidural anaesthesia

SURGICAL DIRECTORATE

DAY SURGERY UNIT

The Effect of Visual and Performing Arts on the Preoperative Stage

Aim:

- To determine whether the introduction of visual art and live music into the clinical environment had an effect on the psychological, physiological, and biological measurements taken during the preoperative preparation of patients undergoing surgery

Size of the sample: 14 subjects. There were 8 subjects in the control group and 6 in the study group

### Variables:

The levels of cortisol, Immunoglobulin A (IgA), blood pressure and heart rate, and the amount of induction agents required prior to anaesthesia, were measured throughout the preoperative stage on:

- 1) patients prepared in the absence of visual art and live music - control group
- 2) patients prepared in the presence of visual arts and live music - study group

The psychological effect on both groups of patients was analysed using a short questionnaire with a 10 point scale (enclosed), completed before being discharged.

- Cortisol and Immunoglobulin A (IgA) concentrations were measured in the saliva at 4 time-points during the preoperative stage:
  - 1<sup>st</sup> sample: on arrival to the clinic
  - 2<sup>nd</sup> sample: on entering the cubicle (average of 30 minutes after arrival)
  - 3<sup>rd</sup> sample: in the cubicle (30 minutes after entering)
  - 4<sup>th</sup> sample: on entering the anaesthetic room
- Vital signs - level of blood pressure and heart rate - were measured at 2 time-points:
  - 1<sup>st</sup>: in the cubicle
  - 2<sup>nd</sup>: in the anaesthetic room
- Amount of induction agents prior to anaesthesia
- Anxiety scores

### Analysis:

Table 1. Analysis of Vital Signs

	Time	Mean		Difference (Trial – Control)	95% CI
		Trial Group	Control Group		
Systolic Blood Pressure (mmHg)	In Cubicle	116.4	125.4	-9.0	-26.9 to 9.9
	In Anaesthetic Room	114.6	142.6	-28.0	-42.1 to -13.9
Diastolic Blood Pressure (mmHg)	In Cubicle	68.1	73.5	-5.4	-14.0 to 3.3
	In Anaesthetic Room	62.0	81.9	-19.9	-31.0 to -8.7
Heart Rate (bpm)	In Cubicle	75.8	76.0	-0.3	-10.8 to 10.3
	In Anaesthetic Room	71.8	99.3	-27.5	-40.6 to -14.4

### Statistical method:

- For each of the vital signs measured at each of the two time-points - in the cubicle and in the anaesthetic room - a separate analysis of variance model was fitted. The difference between the study group and the control group and the 95% confidence interval (CI) was calculated

### Results:

- For each of the vital signs - systolic and diastolic blood pressure and heart rate - were measured in the cubicle before the procedure, the study group had shown lower values than the control group. These decreases were not significantly different.
- Measurements of vital signs in patients in the anaesthetic room were lower in the study group compared to the control group. These decreases were statistically significant

Table 2. Analysis of Laboratory Tests

Lab Parameter	Geometric Mean		Ratio (Trial/Control)	95% CI for the ratio
	Trial Group	Control Group		
Cortisol (nmol/L)	2.76	5.35	0.52	0.27 to 0.97
IgA (ugs/mL)	55.8	134.6	0.41	0.03 to 5.06

### Statistical method:

- For each of the laboratory parameters, repeated measures analysis of variance was performed. The data was log transformed prior to analysis. The study group was fitted as a factor and time-point was fitted as a linear trend. The average difference between the study and control group was estimated and back-transformed onto the original scale

### Results:

- The cortisol levels in the study group were 48% lower than in the control group, after taking an average of the data obtained over the whole preoperative preparation period of the patient. This decrease was statistically significant, and it was evidence that this decline followed a linear trend,  $p=0.04$
- There was evidence that the decrease was similar in the two groups ( $p=0.31$ ).
- The concentration of Immunoglobulin A decreased over the preoperative time in both groups, however this decrease was not statistically significant, and could be due to chance.

Table 3. Analysis of Amount of Induction Agent

Variable	Mean		Difference (Trial – Control)	95% CI for the Difference
	Trial Group	Control Group		
Amount of Induction Agent	185.6	247.5	-61.9	-92.9 to -30.8
Amount of Induction Agent (mg/kg)	3.27	4.10	-0.83	-1.55 to -0.10

### Statistical method:

- The amount of induction agents (nominal dose and mg/kg dose) was analysed using analysis of variance. Study group data was fitted as a factor and the difference between the study group and the control group was established. Using a pooled estimate of variance, the 95% confidence interval (CI) for this difference was calculated.

### Results:

- The amount of induction agent required in the study group was 0.83mg/kg less than in the control group. Since the 95% confidence interval for the difference between the two groups does not contain zero, this difference was statistically significant

Table 4. Analysis of Anxiety Scores

Time	Mean		Difference (Trial – Control)	95% CI
	Trial Group	Control Group		
Arrival	4.29	4.88	-0.59	-3.44 to 2.26
Waiting Room	3.00	4.88	-1.88	-4.17 to 0.42
Cubicle	3.29	6.13	-2.84	-5.08 to -0.60
After	2.14	2.50	-0.36	-2.39 to 1.67

### Statistical method:

- Patients were invited to score in a 10 point scale, ranging from 1=not anxious to 10=very anxious. The rating corresponded to the 4 time-point identified in this protocol. The data obtained at each time-point was analysed using a separate analysis of variance. The difference between the study group and the control group and the 95% confidence interval (CI) for this difference was calculated.

### Results:

- The anxiety scores in the study group at each of the four-time points were lower than in the control group.
- Analysis of the data obtained at the time-point in the cubicle showed that the anxiety score in the study group was 2.84 lower than in the control group. This difference was statistically significant.

### Conclusions:

- There is evidence that those patients exposed to visual arts and live music during the preoperative preparation for day surgery had psychological, physiological and biological changes which are of clinical significance.
- Levels of blood pressure and heart rate were significantly lower in the study group compared to the control group, bringing these vital signs to normal values at the crucial time-point in the anaesthetic room.

- Patients who were exposed to visual art/live music required less induction agents prior to anaesthesia than patients who were not exposed to visual arts/live music.
- The anxiety level of patients exposed to visual arts whilst in the cubicle was significantly reduced compared to that of patients waiting in the cubicle in the absence of visual arts.

The Effect of Visual and Performing Arts in Trauma and Orthopaedics Ward

Aim:

- To determine whether visual and performing arts had an effect on the length of stay and the amount of analgesics consumed during the postoperative period of time.

Size of the sample: 45 subjects. There were 23 subjects in the control group and 22 subjects in the study group

Variables:

- The length of stay in hospital after surgery
- The amount of analgesia required by patients after surgery
- Control group: postoperative period in the absence of visual art and live music in the ward
- Study group: postoperative period in the presence of visual art and live music in the ward

Analysis:

Table 1. Effect of the visual and performing arts in the Trauma and Orthopaedic Ward

Variables	Median (10 <sup>th</sup> and 90 <sup>th</sup> percentile)	
	Control Group	Study Group
Length of stay (days)	12 (7 , 17)	11 (7 , 15)
Analgesics per day (mg)	3321 (1232 , 4199)	3467 (1687 , 4064)

Statistical method:

- As the data was skewed, Mann Whitney-U tests were used to determine whether there were differences between the two groups.

### Results:

- ❑ The median length of stay of patients in the study group was 1 day shorter than patients in the control group (95% confidence interval: 3 days shorter to 1 day longer). This result was not statistically significant,  $p=0.36$ .
- ❑ There is strong evidence that patients in the study group required 69mg/day less analgesics than the control group (95% confidence interval: 637mg /day less to 427mg/day more). This result was not statistically significant,  $p=0.80$ .

### Conclusions:

- ❑ Patients who were anaesthetised in the anaesthetic room, with paintings on the ceiling, and the postoperative period in the presence of visual arts and twice weekly sessions of live music in the ward (study group) were discharged 1 day earlier and consumed less analgesia than the control group.

## The Effect of Live Music on HIV/AIDS Patients

### Aim

- ❑ To determine whether the introduction of live music into HIV/AIDS patient care could induce physiological changes. The effect on the numbers of two particular subsets of blood cells - CD4 and CD8 - was identified as an outcome which could have clinical significance.

Size of the sample: 17 subjects. There were 9 patients in the control group and 8 patients in the study group.

### Variables:

- ❑ The number of CD4 and CD8 blood cells.
- ❑ Control group, measurements were taken from patients who remained in the ward at the time of the performance.
- ❑ Study group, measurements were taken from patients who attended the live performance.

### Analysis:

Table 1. CD8 count in blood samples

Variable	Mean difference (post-pre)		Difference (95% confidence interval)
	Control Group	Study Group	
CD8 count	-78	77	155 (40 , 269)

Table 2. CD4 count in blood samples

Variable	Median difference (post-pre)		Difference (95% confidence interval)
	Control Group	Study Group	
CD4 count	-6	1	16 (-3, 73)

Statistical methods:

- A two sample t-test was performed to determine whether the changes in counts, before and after the performance, were different between the two groups. It was applied to the CD8 counts and the mean differences are presented.
- A Mann-Whitney U test was performed to determine whether changes in counts, before and after the performance, were different between the two groups. It was applied to the CD4 counts because the distribution was skewed. Differences in medians are presented.

Results:

- The levels of CD8 cells increased in those patients who attended the live performances. The study group showed a mean increased of 155 cells compared to that of the control group (95% confidence interval: 40 to 269 cell increases). This result was statistically significant,  $p=0.01$ .
- There was no evidence of a change in the level of CD4 cells ( $p=0.22$ ) - a median difference of 16 cells higher in the study group (95% confidence interval: 3 cells lower to 73 cells higher). This result was not significant.

Conclusion:

- Live music appears to have a positive effect on increasing the numbers of CD8 (killer) and less markedly of CD4 (helper) lymphocytes.

STAFF EVALUATION

Aim:

- To determine whether the environment - architecture, lighting, colour, works of art and live performances - contribute to staff satisfaction and have implications for recruitment and retention.

Size of the sample: 325 subjects. There were 62 clinicians, 129 nurses, 12 scientists, 20 managers, and 102 administrators. Percentage of total number of staff: 15%

Variables:

- ❑ Responses to the effect of the overall surroundings - light, colour, works of art and live performances;
- ❑ The influence of this environment on job making decisions;
- ❑ Comparison between the responses of clinicians and nursing staff
- ❑ Gender and age

Analysis:

Table 1. Reponses of the staff to the surroundings

Variables	n	Median	10 <sup>th</sup> and 90 <sup>th</sup> percentiles
Changes in your mood	318	8	5 , 10
Easing your stress levels	317	7	5 , 10
Making a pleasant environment	322	9	7 , 10

Table 2. Influence of the environment on job decisions

Variables	n	Median	10 <sup>th</sup> and 90 <sup>th</sup> percentiles
Stay in current job	318	6	1 , 9
Apply for a job	295	6	1 , 10
Work in a modern hospital	313	7	1 , 10
Work in a traditional hospital	296	4	1 , 8

Table 3. Comparison between the responses of clinicians and nursing staff

Variables	Clinicians			Nursing staff		
	n	Median	10 <sup>th</sup> and 90 <sup>th</sup> percentiles	n	Median	10 <sup>th</sup> and 90 <sup>th</sup> percentiles
Changes in your mood	60	8	6 , 10	128	8	5 , 10
Easing your stress levels	59	7	5 , 10	128	7	5 , 10
Making a pleasant environment	60	10	1 , 10	128	9	7 , 10
Stay in current job	60	6	1 , 10	126	6	1 , 9
Apply for a job	55	6	1 , 10	118	7	1 , 10
Work in a modern hospital	57	7	1 , 10	125	8	3 , 10
Work in a traditional hospital	55	3	1 , 7	116	3	1 , 8

Table 4. Gender of respondents

Variable	n	Percent
Male	72	22.0
Female	254	77.9

Table 5. Clinicians and nursing staff by gender

Variable	Clinicians		Nursing staff	
	n	Percent	n	Percent
Male	26	41	19	14.7
Female	36	58	110	85.2

Table 6. Age of respondents

Age	n	Mean (standard deviation)
All staff	236	36.0 (9.5)
Clinicians	38	40.6 (10.4)
Nursing staff	96	35.0 (8.3)

### Statistical methods:

- The data is skewed, therefore is presented as medians and percentiles.

### Results:

- The respondents indicated that this healthcare environment, which integrates architecture, light, colour, visual arts and live performances, greatly influences their job decisions.
- There were no differences between clinicians and nursing staff responses.

### Conclusions:

- This evaluation indicates that all staff are aware of the healthcare environment, which largely contributes to their decision making.
- The integration of the visual and performing arts into the healthcare environment is essential for bringing job satisfaction and it may help in the recruitment and retention of staff.

Contributors: clinicians, nurses and managers of each clinic selected as unit of research at Chelsea and Westminster Hospital. Laboratory tests were carried out by P. Evans, A. Clow, F. Hucklebridge, Department of Biochemical Science and Department of Psychology, University of Westminster, London.

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