SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

This study investigated the use of audiovisual installations in the PET uptake room as a means to reduce patient anxiety and false-positive uptake of 18F-FDG in the body.

Intervention to Lower Anxiety of 18F-FDG PET/CT Patients by Use of Audiovisual Imagery During the Uptake Phase Before Imaging

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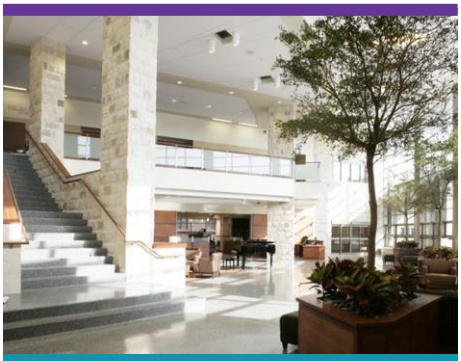
Key Concepts/Context

PET (positron emission tomography) is a method for imaging functional processes in the body. Many patients undergoing PET experience high levels of anxiety throughout the procedure. High patient anxiety can affect hospital workflow and overall patient experience, and can cause false-positive uptake of 18F-FDG, a necessary biomarker that is administered to patients via injection and detected by PET scanners in order to render images. 18F-FDG uptake can occur in both muscles and brown adipose tissue (BAT). Uptake of 18F-FDG can result in low quality images, thereby complicating medical diagnosis and adding further difficulty to the entire PET process. Debate over the use of drugs to reduce anxiety in PET patients has led to the exploration of nonpharmacologic interventions such as audiovisual installations in PET uptake rooms. Previous studies suggest that room temperature may also affect 18F-FDG uptake in BAT, but the best temperature for uptake rooms remains undetermined.

Methods

This study was conducted in 2 successive stages at a hospital cancer institute in the Netherlands. The first stage monitored patients to gain insight into the effectiveness of the nonpharmacologic interventions (audiovisual installations in an uptake room). The second stage focused on a subset of measurements in order to better quantify patient anxiety and 18F-FDG uptake.



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- 101 outpatients participated, 35 in the first stage and 66 in the second stage. 49% were male and 51% were female. The median age was 58 with a range of 18 to 81 years. 59% had already been to a PET facility before while 41% had never visited such facilities prior to the study.

- Patients were randomly assigned to either the room with the audiovisual installation or a room without the installation.

- 51 total patients experienced the nonpharmacologic intervention: 15 in the first stage, 36 in the second stage.

- 50 total patients did not experience the installation: 20 in the first stage and 30 in the second.

- 3 uptake rooms for PET patients were used, sized at approximately 3 x 3 m and each containing a standard hospital bed.

- 1 of the 3 uptake rooms featured the nonpharmacologic intervention, which included nature scenes playing from a 47-inch television above the patient bed, ambient electronic music played at a low volume, and monochrome or colored rim lighting that changed slowly and gradually in accordance with the colors on the television screen. Light spots were situated next to the television screen to assist physicians with 18F-FDG injection. The workflow of the intervention includes a 2 minute explanatory preview of the installation, an "injection" mode during the administration of 18F-FDG, a "very-low-stimuli" mode allowing the patient to rest for 30 minutes, and a 30 minute "low-stimuli" mode to relax the patient for the remaining time before the PET procedure. All parameters were controlled from outside of the room by a technician operating a control panel.

- Patients who did not experience the instillation were placed in 1 of the 2 normal uptake rooms.

- To measure anxiety, an 8-item State-Trait Anxiety Inventory (STAI) questionnaire was completed by the patient before and after the uptake period. 2 points per question, 16 points indicating the highest level of anxiety.

- Physiologic parameters including heart rate, muscle activity, skin conductance level, and salivary cortisol concentration were measured to potentially further quantify effects of patient anxiety and 18F-FDG uptake. Since none of these parameters correlated significantly with STAI test results, these measurements were not used as valid representations of patient anxiety.

- 18F-FDG uptake was visually evaluated by consensus and analyzed by comparing presence–absence ratios between cohorts.

- Outdoor temperature was investigated as a nuisance factor since it is believed to influence 18F-FDG uptake in BAT. Mean outdoor temperature on the day of PET examination was analyzed retrospectively at the nearest measurement location.

- Temperatures inside the audiovisual installation room and in one of the control rooms were measured across 10 working days, several weeks after the experiment was conducted, so lacked control. Both measurements were done close to the ceiling and at a similar distance from the door.

Findings

Results indicate that 59% of participants entered PET uptake rooms with high anxiety and many demonstrated unwanted 18f-FDG uptake in muscles and BAT. Based on STAI test results, the audiovisual installation significantly lowered patient anxiety. Patients who experienced the nonpharmacological intervention also showed significantly less 18F-FDG uptake in BAT. Considering the reduction of patient anxiety and improvement of PET image quality after exposure to audiovisual stimuli, the nonpharmacologic intervention could be used either as a replacement or supplement to pharmacologic means aimed at lowering anxiety. Outside temperature was found to have a larger influence on uptake in BAT over indoor temperture in the uptake room.

Limitations

The authors defined the following limitations: the experiment was not fully masked, meaning the patients in the intervention group may have been treated previously in a room with audiovisual instillations. Effectiveness and quantity of the instillation's features could be better assessed and optimized if the individual effects of video, audio, and lighting were analyzed separately. Several possibly confounding factors could be taken into consideration, including skin temperature, room temperature on the day of measurement, use of blankets, exact outdoor temperature, transportation means to the PET facility, and time spent in the waiting room.

Design Implications

Various design factors may be considered in the construction of optimized audiovisual instillations in uptake rooms; television screen size and placement, music selection and volume, lighting intensity and placement, bed comfortability, room size, overall architectural aesthetic and room temperature should all be considered. Measures could be taken to expand relaxing atmospheres to waiting rooms or other appropriate areas to help further reduce anxiety before and after PET procedures.