Study about the effects of dental noises on the emotional experiences of children aged 6 to 10 years. A pilot study

**ABSTRACT**

**Aim** The aim of our study is to verify if some of the noises produced in a dental surgery, especially those of high-speed drill and Erbium laser, might cause anxiety to children.

**Materials and methods** In order to confirm our hypothesis, we recorded these noises and then reproduced them to a group of children in a neutral setting, in this case at school. The children were aged 6 to 10 years, 55.9% were Italian, while the remaining 44.1% were of other nationalities. Some of them already had a previous experience at the dentist’s.

**Results** The range of images recalled by the children is very small, and they all refer to a realistic, imaginary and sometimes daily context (domestic, family and game related). Such representations have rarely been associated to negative sensations.

**Conclusion** The noise environment of the dentist’s surgery, for what concerns the two stimuli we analysed (high-speed drill and Erbium laser), does not cause an anxious reaction to the majority of children; as a matter of fact the percentage of positive sensations and emotions turns out to be predominant. The results obtained suggest it would be useful to protect this natural tendency, finding out the best method to prevent adult models, such as parents or clinical staff, from affecting it in a negative way.

**Keywords:** Dental noises; Child emotions.

**Introduction**

Music and sound evoke physiological (in terms of level of engagement, active/passive control of the listening process), cognitive (concerning attention, memory, perceptual coding, expectation, evaluation) and affective (related to emotional reactions, such as liking/disliking, or to the mood) responses [Miell et al., 2005].

Music and sound fascinate us, especially when they help us recalling a personal experience [Blacking, 1973; Benenzon, 1983; Canepa, 2004] that could be either negative or positive. We chose to focus on the relationship between children and sound because it is instinctive, while the adults’ reactions are often conditioned by their past “history”. Moreover it is generally well-known that dental experiences could cause anxious reactions, induced by environmental and relational (especially with the dental staff) stimuli, to a significant number of patients [Van Waaijen et al., 2001; Baier et al., 2004; Peretz et al., 2004; Ramos-Jorge et al., 2006]. Lastly, the effectiveness in adult subjects of disguising the noises of the high/low speed drill during dental treatments has already been confirmed [Canbek and Willerhausen, 2004]. These researches were based upon the high statistic value of the association between dental noises and anxiety in adult patients.

The purpose of the present study was to examine if children would react in the same way as the adults. In other words, to verify if children are indeed affected by dental noises.

**Materials and methods**

As previously mentioned, we chose to record two dental surgery noises and to reproduce them in a school environment.

The research was conducted in cooperation with the San Filippo Neri primary school (situated in Genoa, Italy), which was selected because of its multi-ethnic background.

Our sample consisted of 68 children aged 6 to 10 years; 30 of them (44.1%) were from a foreign country (21 from Ecuador, 4 from Spain, 1 from the Philippines, 1 from Peru, 1 from Chile, 1 from Albania and 1 from Russia) and 38 (55.9%) of them were from Italy.

From the international literature, the three most fearful dental experiences are the following:

1. Extractions [Van Waaijen, 2001].
2. Local anaesthetic [Blitz et al., 2010].
3. Fillings [Kudo et al., 2008].

Among the three mentioned treatments, only the third one produces noise.

The sound samples chosen for the present study were:

1. Turbine drill on dental resin element;
2. Erbium laser with a 300 mill joules energy, and a frequency of 15 Hz.

The sounds were taped in a dentist surgery with a Minidisk Sharp MT99 44.100 Hz, 16 bits High-Fi system, and were then reproduced in the classrooms for 15 seconds at a frequency of 44.100 Hz, at a medium volume with a portable Philips AZ 8394 CD player.

The room was quiet and the children sat in their chairs. The teacher remained in the class during the entire test, in order to keep the emotive and environmental situation as close as possible to the usual school context.

Before the actual listening, children were asked to close their eyes, to remain silent for a few seconds to better focus on the sounds and to answer some questions.

They were asked to write down the first thing that came into their mind (images, memories and emotions) answering to an open questionnaire (Fig. 1):
DENTAL NOISE AND ANXIETY IN SCHOOL CHILDREN

NAME ___________________  SURNAME _____________________
NATIONALITY _______________________  AGE ____  CLASS _____
WHAT DID YOU THINK ABOUT WHEN YOU LISTENED TO THIS SOUND?
1° NOISE ______________________________________________
2° NOISE ______________________________________________
WHAT DO YOU FEEL? 1° NOISE 2° NOISE
NOTHING
CALM
FEAR
JOY
SADNESS
DID YOU LIKE THE SOUND? 1° NOISE 2° NOISE
HAVE YOU EVER HEARD IT BEFORE? 1° NOISE 2° NOISE
WHERE? 1° NOISE 2° NOISE

a) describing the visualised image;
b) determining the noise-related emotion;
c) giving an affective response;
d) recalling a memory associated to that sound.

Before the test was taken, it was noted whether the child had already had a previous experience at the dentist's or not (Fig. 2).

Results

The aim of this study was to verify if children are actually affected by dental noises, i.e. if just hearing them is enough to experience anxiety.

A sample of 68 subjects does not allow a significant statistic analysis and moreover it is not sufficiently randomised, given that all the children belong to the same school. But it is true that it represents a highly multi-ethnic reality. Despite the ethnic variegation of the sample, it is remarkable how limited the amount of images recalled by the children is (Table 1); they all belong to a realistic or imaginary context, such as:
- domestic (vacuum cleaner, hair dryer);
- familiar (car, wind, plane, mainly mentioned by non Italian children);
- game-related (gun shot, motorbike, helicopter).

The representations evoke daily objects (Tables 4 and 5). Moreover they are rarely associated to negative sensations (Table 2, 3).

Discussion

Until now, those who have studied the relationship between sound stimuli and psychophysical responses have predominantly chosen adult subjects, whose reactions might have been influenced by their past experience. Cambek [2004] experimented the possibility of reducing
stress and anxiety, and consequently improving patients’ cooperation, making them listen to specific frequencies and waves ranging from 0.02 to 20khz with headphones, in order to disguise the noises produced during the dental treatment. On the other hand, with our present research, we confirm that the noises per se, deprived of every connection with specific dental treatments, do not evoke any stressful or anxious experience in children. It is therefore not necessary to disguise the noises, in the way we may proceed with adults.

The main objective is to protect the young patients’ natural response, especially during their first visits to the dental office. It is the dentist’s and his colleagues’ duty to introduce the sounds of the instruments that they are going to use. In this way, the positive association attributed to these noises by children is not going to be "corrupted", since the context in which they first experience them is serene and cooperative.

The most qualified, and consequently used, psychological technique for the dentists’ approach to the child is the TDS one (tell-show-do) [Crossley et al., 2002; Law et al., 2003; Kantaputra et al., 2007]. We suggest to transform it into “TSDL” (tell-show-do-listen), also including a “listening” moment.

Moreover it would be useful to inform and re-educate the reference adults, including parents, making them aware of the fact that their children natural responses to dental noises are related mainly to everyday situations and it would be better not to negatively affect them.

Conclusion

The sound environment of the dentist’s surgery, for what concerns the two stimuli we analysed (high-speed drill and erbium laser), does not cause an anxious reaction to the majority of the children interviewed; as a matter of fact the percentage of positive sensations and emotions turns out to be predominant, showing us that children are scarcely influenced by dental noises.

It is our duty to protect this natural propensity. We should deepen this subject, going along this path, in order to better define relevant techniques.

Acknowledgement

The authors would like to thank the teachers and the students of the San Filippo Neri School in Genoa (Italy) for the logistic support and Alessandra Auditore, Music Therapist and friend, for her contribution.

References

Benenzon R. Manuale di musicoterapia. Roma; Edizioni Borla; 1983.