

Clowntherapy in paediatric dentistry: The psychological approach to the paediatric patient



A. Cosi, M. Tieri, L. Lombardi¹,
C. Ciaravino, S. D'Ercole, D. Tripodi

Department of Medical, Oral and
Biotechnological Sciences, University "G.
d'Annunzio", Chieti-Pescara, Chieti, Italy
¹Department of Psychological, Health, and
Territorial Sciences

E-mail: simonetta.dercole@unich.it

DOI 10.23804/ejpd.2022.23.03.12

Abstract

Aim Anxiety towards dental treatments and visits in children are often cause for the avoidance and/or failure of the treatment itself, as well as a reason for stress in both the patient and the orthodontist. The aim of the research is to understand if the use of clown therapy in dental waiting rooms is efficient in bringing down the level of preoperative anxiety in paediatric dental patients.

Methods Two psychometric tests were used: CFSS-DS (Dental Subscale of the Children's Fear Survey Schedule) and FIS (Facial Image Scale), after the translation of the original versions, to both the patients and their parents. The CFSS-DS is the most used instrument in order to assess dental fear in children, it is composed by 15 questions that outline situations which children and adolescents will have to face while on the dental chair. The FIS is a visual analogical scale that uses faces as indicators of anxiety.

Results The sample consists of 120 subjects, of an age group that ranges from 4 to 12 years (average age: 7.08; SD: 1.817). The average rating on the FIS testing is 2.40 (SD: 1.353, $\alpha=00$) in the control group and 1.25 (SD: .550, $\alpha=.002$) in the test group. When it comes to the CFSS-DS, the average rating of the control group is 41.20 (SD: 10.675), meanwhile the average rating of the test group is 27.70 (SD: 5.796), with $\alpha=.000$ in both groups.

Conclusions Clowntherapy proves to be an efficient non-pharmacological method to reduce anxiety and dental fear in paediatric patients, offering a valid and practical support for paediatric dentists.

KEYWORDS Paediatric patients, Clowntherapy, Approach, Fear, Anxiety.

Introduction

The first dental examination represents a crucial moment for young patients and is often met with anxiety and fear, especially by parents [Acharya et al., 2019]. Dental fear is often a strong cause of stress for young patients, as it is for the operator, due to the extra time required for the treatment of teeth in this specific kind of patient and, as suggested by various research, dental fear is the main predictive factor to anticipate how children will act during dental treatments [Scandurra et al., 2021; Anne et

al., 2016; Vieson et al., 1983]. Considering how closely related dental anxiety and poor oral health are, as well as the major value of the first dental experience, it is crucial for the team to work in order to reduce dental fear in their patient right from the start [Paglia et al., 2016]. There are two methods to decrease anxiety: pharmacological and non-pharmacological [Cianetti et al., 2017; Mittal et al., 2012]. The only pharmacological technique that is able to reduce or cancel anxiety is that of conscious sedation, be it through N₂O/O₂ inhalational sedation and enteral sedation [AAPD, 2019/2020; Arcari et al., 2018]. Non-pharmacological methods include tell-show-do, non-verbal communication and voice control, positive reinforcement, desensitisation, distraction techniques and, eventually, live modelling [Carli et al., 2022]. Every method is applied to and works well with specific age groups and kinds of patient [Sharath et al., 2009; Birardi et al., 2008; Bagattoni et al., 2020].

Although there is another alternative method to the ones listed before, it is easily viable and devoid of the above mentioned limitations: Clown therapy is fairly common in hospital departments but was never really considered in the field of dentistry [Messina et al., 2014]. "Gelotology" is a discipline discovered by Norman Cousins, it focuses on the therapeutic potential of laughter, and has its roots in psychoneuroimmunology (PNI), a science that studies the interrelation between the central nervous system, the endocrinal and immunological ones [Anolli, 2005; Bottaccioli, 2005]. In this context, researchers argue that stress causes weakening of the immune system, making under-stress individuals more vulnerable to more or less severe illnesses because of the reciprocal influence between nervous and immune system [Raimondo, 2013; Caprioglio et al., 2004]. Similarly, studies show that laughter is strictly linked to the cognitive and emotive levels, and that it improves pulmonary ventilation, muscular activity, blood pressure levels, liver and intestinal functions [Hayashi K et al., 2016; Miller et al., 2009; Giuca MR et al., 2021]. Furthermore, unlike stress, pleasurable sensations actually alter the levels of cortisol, endorphins, serotonin and dopamine, growth hormone (GH), epinephrine and activity of natural killer cells, immunoglobulin, white blood cell count and interferon γ [Efrat-Triester et al., 2021; Louie et al., 2016; Saliba et al., 2016; Ghodsbin et al., 2015; Dunbar et al., 2012; Kim et al., 2011; Donata, 2002]. Lastly, recent studies on rats, conducted by Shimpei Ishiyama [2015], show that triggering "laughter" can encourage the birth of new neurones in the hippocampus. Research show that just as the anticipation

Acronym.....Date.....

Gender: ☐ M ☐ F
 You were born in the year _____ and in the month _____
 Weight _____ Height _____

Are your parents separated or divorced? ☐ Yes ☐ No
 Are your parents both alive? ☐ Yes ☐ No If no, please specify:

Who lives in the house with you?

Mom ☐ Yes ☐ No
 Dad ☐ Yes ☐ No
 Sisters ☐ Yes ☐ No If yes, write how many sisters you have _____ and indicate their age _____
 Brothers ☐ Yes ☐ No If yes write how many brothers you have _____ and indicate their age _____
 Grandparents ☐ Yes ☐ No
 Others (specify who it is) _____

A few more questions about your family...

How old is your father? _____
 What work does your father do? _____
 What is your father's educational qualification?
☐ Elementary school
☐ Lower secondary education
☐ High School Diploma
☐ Degree
☐ Other (please specify) _____

How old is your mother? _____
☐ What work does your mother do? _____
☐ What is your mother's educational qualification?
☐ Elementary school
☐ Lower secondary education
☐ High School Diploma
☐ Degree
☐ Other (please specify) _____

Have you ever been to a dentist before? ☐ Yes ☐ No
 If so, who accompanied you? _____

Today why did you come to the visit? _____
 Who accompanied you? _____

In the last year have you found yourself facing particularly difficult moments (at school, at home, with friends, etc.)?
☐ Yes ☐ No

If yes, please specify which ones: _____

FIG. 1 Anagraphic sheet.

of pain increases anxiety and the perception of pain itself, the distraction that comes from clown therapy can actually decrease its intensity, deflecting the child's attention towards a pleasurable stimulus, in order to decrease the perception of pain and the psychological distress [Markova et al., 2021]. Humourism and laughter have the ability to release endorphins and to lower stress hormones, so to reduce the amount of pain

felt by the patient and raise tolerance towards dental evaluations and the actual operation that may cause real physical pain [Felluga et al., 2016; Dionigi et al., 2013; Finlay et al., 2013].

The aim of this research is to assess, by means of psychometric instruments, the effects of clown therapy in reducing or removing anxiety and dental fear as well as improving the overall mood of the young patient waiting for the visit or dental treatment. This way, an effective action might increase the willingness to cooperate in the patient during the dental

treatment. For these reasons, this paper represents the first research in the world on this matter in a dental environment.

Materials and methods

Distribution of the sample

This study was conducted by the working group of Medical, Oral and Biotechnological sciences in the paedodontics department of the “University G. d’Annunzio Chieti-Pescara”, Chieti, Italy.

The sample consists of 80 children, randomly selected among patients in the paediatric dentistry department, who were then divided equally between cases and controls.

Subjects aged 4 to 12 years were included in the study, and included children visiting for the first time and children treated before in the above-mentioned department. Subjects unwilling to take part in the study, together with subjects who were not able to answer questions in the survey because of the lack of understanding of the questions, were excluded.

Design of study

The study involved the presence of one or two volunteer clowns, members of the “La compagnia del sorriso – Onlus” association in Chieti, in the section of paediatric dentistry of the Medical, Oral and Biotechnological Sciences Department in the dental clinic of the “University G. d’Annunzio Chieti-Pescara”. These volunteers greeted and entertained patients in the waiting room. Various recreational activities were performed by the clowns, which varied based on the age of the children involved, their medical status, past dental experiences and their first reaction upon seeing the clowns. A few minutes before the visit one of the clowns, or a healthcare professional, informed a parent (or a tutor) of the study being conducted, and obtained the permission to subject the child to two different surveys aimed at identifying the patient’s level of anxiety. Furthermore, parents were asked to fill in an anagraphic sheet about their child (Fig. 1), so to obtain as detailed information as possible in order to understand the child’s behaviour. For the purpose of this study, besides the 40 patients (study group) that were selected during the clown therapy, another 40 subjects (control group) not being subjected to clown therapy were selected, while waiting.

Instruments

- Dental Subscale of the Children’s Fear Survey Schedule (CFSS-DS)

The Dental Subscale of the Children’s Fear Survey Schedule (CFSS-DS) is the most used instrument for the measurement of dental fear in children, by registering difference in DFA between experimental and control groups, in order to select fearful and non-fearful children out of a bigger pool of people [Radomski et al., 2019]. The CFSS-DS consists of 15 questions that describe situations children and adolescents are confronted with while on the dentist’s chair (Fig. 2). For every question the child can specify his fear on a scale from 1 to 5 (Likert Scale), classified as follows: 1. Not frightened; 2. Little frightened; 3. Frightened; 4. Pretty frightened; 5. Very frightened. The final score is comprised between a minimum of 15 (minimal fear) and a maximum of 75 (maximal fear). The cut off value that defines a child with dental anxiety is 38 [Birnie KA et al., 2018]. The test has good reliability and validity, and is also accepted by higher research and other psychometrical scales, such as the Venham Picture Test and

1. Dentists	12345
2. Doctors	123 4 5
3. Injections	12345
4. Having somebody examine the mouth	12345
5. Having to open your mouth	12345
6. Having a stranger touch you	12345
7. Having somebody look at you	12345
8. The dentist drilling	12345
9. The sight of the dentist drilling	12345
10. The noise of the dentist drilling	12345
11. Having someone put instruments in your mouth	12345
12. Choking	12345
13. Having to go to the hospital	12345
14. People in white uniforms	12345
15. Having the nurse clean your teeth	12345
The anxiety is marked in? point anxiety scale:	
1. Not afraid at all	
2. Very little	
3. Moderate fear	
4. Pretty much afraid	
5. Very much afraid	

FIG. 2 Dental Subscale of the Children’s Fear Survey Schedule (CFSS-DS).

the Dental Anxiety Scale [Yon MJY et al., 2020; Paglia et al., 2017; Beena et al., 2013]. The survey is utilised in two versions: one that must be filled out by parents for their children and one for the children themselves. Even though the versions filled by the parents is sufficiently reliable and valid, the ones filled out by the children is more accurate. However, it is impossible for younger children to fill out a survey, so it is necessary to rely on their parents or tutors [Krikken et al., 2013; Caprioglio et al., 2009].

- Facial Image Scale (FIS)

The Facial Image Scale is a visual analogical scale that uses faces as indicators for anxiety and represents a valid way to assess dental anxiety in children in a clinical context [Floríndez et al., 2020]. The FIS (Fig. 3) is made up of five different facial expressions ranging from extremely happy to extremely sad, and is shown to the young patients at the start of the treatment to measure the state of anxiety: it is asked of them what expression of the scale better represents their mood in that moment. After their reply, a value is given to each face, from 1 to the happiest to 5 to the saddest. The current scale of facial images has a limited number of expressions to pick from, making it easier to comprehend and determine the score [Aldhelai TA et al., 2021]. The applicability of this psychometric instrument is proved by comparing the result it gives to the ones given by another psychometric instrument that measures the same phenomenon; on this matter, a good compatibility was found between VPT and FIS, pointing at a good validity for the FIS test [Shuurs et al., 1993].

Statistical analysis

The software that was used for the statistical analysis of the

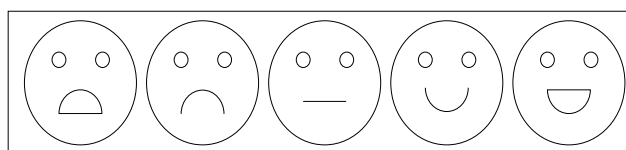


FIG. 3 Facial Image Scale (FIS).

results that emerged from the anagraphic sheet, CFSS-DS and FIS, given to the patients, was SPSS (Statistical Package Social Science) [IBM]. The average and standard deviation of the total score obtained from the answers given to the tests, both the CFSS-DS, given to children and parents, and the FIS, only given to the children, were reported.

The prevalence of DFA was assessed using both scales, defining children affected by DFA as children who reported a score over the average of the scale + 1 DS (so, CFSS-DS score ≥ 38 and FIS score ≥ 25) [Cianetti et al., 2017a; Klingberg e Broberg, 2007; Wogelius et al., 2003a].

Results

Eighty subjects took part in the study: 44 males (55%) and 36 females (45%) (Fig. 4), and the age of the sample ranges between 4 and 12 years, with an average age of 7.08 years (SD: 1,817) (Table 1).

In Table 2 average scores obtained with the use of evaluation measures such as the FIS and the CFSS-DS respectively to the control and the case group are shown. More specifically, when

	N	Minimum	Maximum	Mean	Std. Deviation
Age (years, months)	80	4	12	7.08	1.817
TOTAL FIS	80	1	5	1.83	1.174
CFSS-DS-TOTAL	80	16	58	34.45	10.891

"N" is identified as the number of samples that were selected for the study. "Minimum" and "Maximum" respectively account for the age of the youngest and the oldest participant; "Mean" accounts for the average age, "Std Deviation" is the standard deviation of the average age.

TABLE 1 Descriptive statistics.

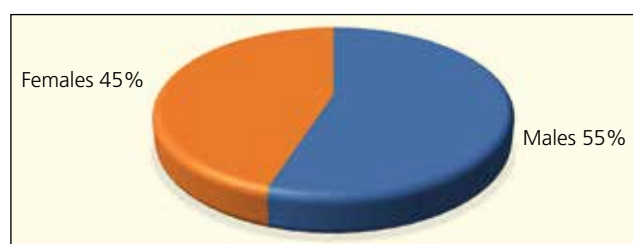


FIG. 4 Pie chart showing the distribution of the sample based on gender.

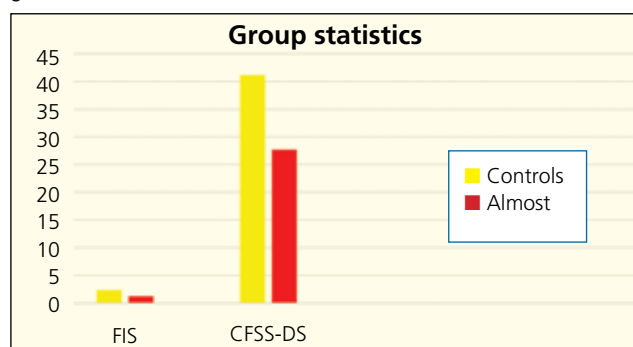


FIG. 5 Group statistics: the histogram graphically shows average scores obtained from the analysis of the FIS and the CFSS-DS.

looking at the FIS in the control group the average turns out to be 2.40 (SD: 1.353, $\alpha=00$), while the average in the case group amounts to 1.25 (SD: .550, $\alpha=.002$). On the other hand, looking at the CFSS-DS, the average of the score in group 1 is 41.20 (SD: 10.675), that of group 2 is 27.70 (SD: 5.796), with $\alpha=.000$ both in the test and the control group (Fig. 5).

In Table 3, a significant correlation between the total FIS and the total CFSS-DS in the control group is underlined. However, the same is not valid for the test group.

With the observation of table 4 and 4b, we can look at the distribution in the studygroup and the control group based on answers given to the 15 questions of the CFSS-DS.

Discussion

The aim of this research was to understand if clown therapy activities in waiting rooms, before a dental visit or a dental treatment, could represent a good solution in order to approach patients and reduce the level of dental anxiety. Then the analysis considered the effects of clown therapy on dental anxiety before treatment.

From the statistics presented in this study, it is apparent that the results validate the initial hypothesis: clowns with their activities have the ability to reduce the level of anxiety in children. In order to obtain a successful result, it is of crucial importance to investigate on the age of the child and, perhaps more importantly, his/her relationship with the figure of the clown, despite some scepticism from children and parents the activity experienced actually proved to be successful, also thanks to some positive reinforcement from the therapeutic clown [Linge et al., 2012].

The clowns tried to get the children's attention communicating or making them guess their absurd names, asking for advices for the eventual addition of new figures or colours on their coat, showing their clumsiness or even showing themselves to be disappointed when a child did not give them enough attention. Child participation did not matter to the clowns, as they promised personalized balloons to every child that would keep a good attitude during the treatment or visit. After being assured they would keep a good attitude, the clowns started making balloons of the shape and colour desired by the patient. In addition, when asked they would make more balloons for the children to gift to their parents or siblings. It is believed that the possibility of choosing the features of the balloon, the possibility of playing with it or gifting it improved the enthusiasm and the willingness to collaborate of the patients in the waiting room.

Statistical analysis shows that the gender of the examined sample does not influence the result of the research, since the percentage of males and females tested is nearly identical (M: 55%; F: 45%).

As previously stated, the instruments utilised for this research were: the Children's Fear Survey – Dental Subscale (CFSS-DS) and the Facial Image Scale (FIS).

	Controls=1 Cases=2	N	Mean	Std. Deviation
TOTAL FIS	1	40	2.40	1.353
	2	40	1.25	.550
TOTAL CFSS-DS	1	40	41.20	10.675
	2	40	27.70	5.796

TABLE 2 Average of the scores obtained from the FIS and the CFSS-DS, both in the group of study and in the control group.

Control=1; Cases=2			Sesso (M=1/F=0)	TOTAL CFSS-DS	TOTAL FIS	Age (years, months)
1	Gender (M=1/F=0)	Pearson correlation	1	.054	.064	.0260
		Sig. (2-tailed)		.820	.790	.268
		N	40	40	40	40
	TOTAL CFSS-DS	Pearson correlation	.054	1	.613**	.251
		Sig. (2-tailed)	.820		.004	.286
		N	40	40	40	40
	TOTAL FIS	Pearson correlation	.064	.613**	1	-.050
		Sig. (2-tailed)	.790	.004		.834
		N	40	40	40	40
	Age (years, months)	Pearson correlation	.260	.251	-.050	1
		Sig. (2-tailed)	.268	.286	.084	
		N	40	40	40	40
2	Gender (M=1/F=0)	Pearson correlation	1	-.219	.328	.293
		Sig. (2-tailed)		.354	.158	.210
		N	40	40	40	40
	TOTAL CFSS-DS	Pearson correlation	-.219	1	.107	-.151
		Sig. (2-tailed)	.354		.653	.524
		N	40	40	40	40
	TOTAL FIS	Pearson correlation	.328	.107	1	.115
		Sig. (2-tailed)	.158	.653		.628
		N	40	40	40	40
	Age (years, months)	Pearson correlation	.293	-.151	.115	1
		Sig. (2-tailed)	.210	.524	.628	
		N	40	40	40	40

TABLE 3 Correlations: eventual correlations between gender, total CFSS-DS, total FIS and age are shown.

The FIS, which is characterised by the presence of five different facial expressions to indicate five different moods is suitable to younger children, as it is easier to understand when compared to other instruments; it is easy to submit in the waiting room and the score is easy to identify, as it is a mere reflection of the chosen face [Fernandes SC et al., 2021]. Furthermore, it easily captures the child's attention, can be filled out by subjects with cognitive and linguistic limits, and is easy to interpret. Finally, since the role of these instruments is to supply the clinician a support to see how the patients is responding to the treatment, it should not be understated that the FIS gives an immediate response on how the patient is feeling in the waiting room, so the clinician can plan an adequate treatment approach [Buchanan et al., 2002]. Likewise, the Children's Fear Survey – Dental Subscale, even though composed of 15 questions, has a quick and easy application, representing an economically viable solution to identify DFA. It is for this reason that an ever-growing number of countries use this survey, prompting its translation into many different languages, in order to conduct research [Janneke et al., 2013]. However, this scale is not perfect. Firstly, it has been argued by many authors that the two different versions: one for the child and one for the parent, can prove to have a notable impact on the final result. In addition to this, it has been shown that parents are often unable to detect DFA in their children: in particular, notably anxious parents tend to underestimate dental fear in their children, while on the other hand less anxious parent tend to overrate it [Rantavuori et al., 2009]. Another limit with the CFSS-DS deals with the fact that children cannot usually identify choices in a 5 points scale [Norris M et al., 2010; Muris et al., 2002;]. Finally, not every element proves to be equally

relevant when evaluating children's dental fears, since some of them seem to be linked to strictly dental fears, while others are linked to general medical fears [Leko et al., 2020; Chakradhar et al., 2020; Pani et al., 2016].

When it comes to measurements, the difference in the level of anxiety between study and control group is statistically significant. In particular, the average anxiety levels taken from CFSS-DS in the test group amounts to half that of the control group. Furthermore, when looking at the control group, a correlation between FIS and CFSS-DS ($\alpha=.004$) emerges; the same correlation is nowhere to be found in the test group. This is probably attributable to the fact that averages in the test group are significantly lower than averages in controls, which could be the cause of the significant correlation that emerged.

In addition to the identification of dental fear in the patient, the CFSS-DS gives the possibility to identify the conditions that are feared the most. Out of the 80 completed questionnaires, it is apparent that what scares children the most within a dental context are the idea of the dentist, of being touched by a stranger, the turbine and the noise it produces, as well as the possibility of suffocation caused by the presence the instruments in their mouth, and the fear of having to go to the hospital. Another possibly relevant consideration can be made on the remaining requirements: within the test group, the score given to each answer is really low, however, the same cannot be stated for the control group.

Our results are in line with the study from Golan et al. [2009], and with the research conducted by Dionigi et al. [2013]. In those studies, the m-YPAS was used as a scale, pre-operative anxiety in paediatric subject was analysed, respectively in the ER and in the otolaryngology department. Results revealed that the

How do you feel about:	1	2	3	4	5
1. Dentists	18	12	16	4	12
2. Doctors	14	10	0	10	6
3. Injections	4	4	8	0	24
4. Having somebody examine the mouth	26	4	6	2	2
5. Having to open your mouth	26	6	2	2	4
6. Having a stranger touch you	10	6	8	2	14
7. Having somebody look at you	16	10	0	4	10
8. The dentist drilling	12	4	4	6	14
9. The sight of the dentist drilling	14	2	4	4	16
10. The noise of the dentist drilling	12	4	8	2	14
11. Having someone put instruments in your mouth	12	4	4	10	10
12. Choking	8	4	6	0	22
13. Having to go to the hospital	6	2	4	6	22
14. People in white uniforms	30	0	2	4	4
15. Having the nurse clean your teeth	30	8	2	0	2

A Cases

How do you feel about:	1	2	3	4	5
1. Dentists	24	14	2	0	0
2. Doctors	20	8	6	2	4
3. Injections	2	8	12	6	12
4. Having somebody examine the mouth	36	4	0	0	0
5. Having to open your mouth	34	6	0	0	0
6. Having a stranger touch you	20	8	0	4	8
7. Having somebody look at you	36	4	0	0	0
8. The dentist drilling	20	10	2	2	6
9. The sight of the dentist drilling	18	10	10	0	2
10. The noise of the dentist drilling	26	8	6	0	0
11. Having someone put instruments in your mouth	24	6	8	2	0
12. Choking	14	10	4	4	8
13. Having to go to the hospital	10	8	4	4	14
14. People in white uniforms	36	2	0	2	0
15. Having the nurse clean your teeth	36	4	0	0	0

B Controls

TABLE 4 Summary tables of the answers given to the CFSS-DS, respectively of the cases and the control group. Questions are reported in columns, while answers are reported in rows (1: Not frightened; 2: Little frightened; 3: Frightened; 4: Pretty frightened; 5: Very frightened), in the resulting cells the number of subjects spread based on the score given to the specific question.

score was statistically significantly lower in patients treated with clown therapy compared to that of young children treated with Midazolam and that of the control group (m-YPAS clown: 28.3; m-YPAS Midazolam: 35.7; m-YPAS control: 38.4). Nevertheless, this study shows that clowns do not obtain better results on children once they enter the operating room [Dionigi et al., 2013]. This last consideration brings us to our study: indeed, two out of the twenty patients examined, as they sat on the dentist's chair, were not relaxed, an attitude that stopped the dentist from starting the operation. Therefore, it would be of interest to examine, by the use of adequate methods, how clown therapy would impact the patient during the treatment.

Conclusion

In light of this data, it can be stated that clown therapy proves to be a valid method of non-pharmacological approach in order to reduce anxiety and dental phobia in the paediatric patient, making for a practical and valid support for the paediatric dentist.

References

- » «Software IBM SPSS» IBM, [Online]. Available: <https://www.ibm.com/it-it/analytcs/spss-statistics-software>.
- » AAPD. Use of Nitrous Oxide for Pediatric Dental Patients. The Reference Manual of Pediatric Dentistry, 2019/20. 293-298.
- » Acharya S, Jena P, Acharya S. Parental presence in dental operator as a behaviour management tool on children in Bhubaneswar, Odisha, India. *Pesqui Bras Odontopediatria Clin Integr* 2019;19.
- » AlDhelai TA, Khalil AM, Elhamouly Y, Dowidar KML. Influence of active versus passive parental presence on the behavior of preschoolers with different intelligence levels in the dental operator: a randomized controlled clinical trial. *BMC Oral Health* 2021 Aug 28;21(1):420.
- » Anolli M. L'ottimismo. Bologna: Il mulino; 2005.
- » Arcari S, Moscati M. Nitrous oxide analgesic effect on children receiving restorative treatment on primary molars. *Eur J Paediatr Dent* 2018 Sep;19(3):205-212.
- » Bagattoni S, Lardani L, Gatto MR, Giuca MR, Piana G. Effects of audiovisual distraction in children with Down syndrome during dental restorations: a randomised clinical trial. *Eur J Paediatr Dent* 2020 Jun;21(2):153-156.
- » Birardi V, Gola G. Compendio clinico di Odontoiatria Infantile. Milano: Edi Ermes; 2008. P. 3-27.
- » Birnie KA, Noel M, Chambers CT, Uman LS, Parker JA. Psychological interventions for needle-related procedural pain and distress in children and adolescents. *Cochrane Database Syst Rev* 2018;10(10).
- » Bottaccioli F. Psiconeuroendocrinoimmunologia. I fondamenti scientifici delle relazioni mente-corpo. Le basi razionali della medicina integrata. Como: Red edizioni; 2005.
- » Caprioglio A, Mariani L, Tettamanti L. A pilot study about emotional experiences by using CFSS-DS in young patients. *Eur J Paediatr Dent* 2009;10(3):121-4.
- » Caprioglio V, Parietti P. Con le tecniche del buonumore sconfiggiamo depressione, tristezza e malattie psicosomatiche. La terapia della risata 2004, Riza Scienze.
- » Carli E, Pasini M, Pardossi F, Capotosti I, Narzisi A, Lardani L. Oral Health Preventive Program in Patients with Autism Spectrum Disorder. *Children (Basel)*. 2022 Apr 10;9(4):535.
- » Chakradhar K, Dolar D, Kulkarni S, Srikanth Reddy B, Padma Reddy M, Srilatha A. Correlation of dental anxiety with oral health status and treatment needs among 12-year old indian school going children. *Acta Biomed* 2020;91(4).
- » Cianetti S, Paglia L, Gatto R, Montedori A, Lupatelli E. Evidence of pharmacological and non-pharmacological interventions for the management of dental fear in paediatric dentistry: a systematic review protocol. *BMJ Open* 2017 Aug;7(8).
- » Dionigi A, Sangiorgi D, Flangini R. Clown intervention to reduce preoperative anxiety in children and parents: A randomized controlled trial. *J Health Psychol* 2013;19(3):369-380.
- » Dionigi A et al. Clown intervention to reduce preoperative anxiety in

- children and parents: A randomized controlled trial. *J Health Psychol* 2013;19(3):369-380.
- › Dunbar R.I.M., Baron R, Frangoy A, Pearce E, et al. Social laughter is correlated with an elevated pain threshold. *Proc. Royal Society B* 2012;1161-1167.
 - › E. Raimondo. La gelotologia (comico terapia) ed il paziente odontoiatrico speciale, ovvero: un clown dottore contro la paura. *Odontoiatria speciale per il paziente critico e diversamente abile*. Milano: Edi Ermes; 2013. P. 171-181.
 - › Efrat-Triester D, Altman D, Friedmann E, Margalit DL, Teodorescu K. Exploring the usefulness of medical clowns in elevating satisfaction and reducing aggressive tendencies in pediatric and adult hospital wards. *BMC Health Serv Res* 2021;21(1):15.
 - › F. Donata. Ridere è una cosa seria. Milano: Mondadori; 2002.
 - › Felluga M, Rabach I, Minute M, Montico M, Giorgi R, Lonciari I, Taddio A, Barbi E. A quasi randomized-controlled trial to evaluate the effectiveness of clowntherapy on children's anxiety and pain levels in emergency department. *Eur J Pediatr* 2016;175(6):645-650.
 - › Fernandes SC, Loureiro A, Lopes LB, Esteves F, Arriaga P. Children's Attitudes and Behaviors about Oral Health and Dental Practices. *Healthcare (Basel)* 2021 Apr 4;9(4):416.
 - › Finlay F, Baverstock A, Lenton S. Therapeutic clowning in paediatric practice. *Clin Child Psychol Psychiatry* 2013;19(4):596-605.
 - › Floríndez LI, Como DH, Floríndez DC, Vigen C, Floríndez FM, Cermak SA. Identifying Gaps in Oral Care Knowledge, Attitudes, and Practices of Latinx Parents/Caregivers of Children With and Without Autism Spectrum Disorders. *Health Equity* 2021;5(1):185-193. Published 2021 Apr 19.
 - › Ghodsbin F, Sharif Ahmadi Z, Jahanbin I, Sharif F. The effects of laughter therapy on general health of elderly people referring to Jahandidegan community center in Shiraz, Iran, 2014: a randomized controlled trial. *Int J Community Based Nurs Midwifery* 2015;3(1):31-38.
 - › Giuca MR, Lardani L, Ligorì S, Carli E, Giuca G, Miceli M. Oral manifestations in paediatric patients with hepatobiliary diseases: a review. *J Biol Regul Homeost Agents*. 2021 May-Jun;35(3 Suppl. 1):117-125.
 - › Hayashi K, Kawachi I, Ohira T, Kondo K, Shirai K, Kondo N. Laughter is the Best Medicine? A Cross-Sectional Study of Cardiovascular Disease Among Older Japanese Adults. *J Epidemiol* 2016;26(10):546-552.
 - › Ishiyama S. Rat Giggles Point to New 'Joyous' Area of the Brain. *Nature Now* 2015.
 - › Beena JP. Dental subscale of children's fear survey schedule and dental caries prevalence. *Eur J Dent* 2013;7(2):181-185.
 - › Krieken JB, van Wijk AJ, ten Cate JM, Veerkamp JS. Measuring dental fear using the CFSS-DS. Do children and parents agree? *Int J Paediatr Dent* 2013 Mar;23(2):94-100.
 - › Lebowitz Kim R, Sooyen S, Diaz Philip T, Charles F Emery. Effects of humor and laughter on psychological functioning, quality of life, health status, and pulmonary functioning among patients with chronic obstructive pulmonary disease: A preliminary investigation. *Heart & Lung* 2011;310-310.
 - › Krieken JB, van Wijk AJ, ten Cate JM, Veerkamp JS. Measuring dental fear using the CFSS-DS. Do children and parents agree? *International Journal of Paediatric Dentistry* 2013;94-100.
 - › Leko J, Škrinjarčić T, Goršeta K. Reliability and validity of scales for assessing child dental fear and anxiety. *Acta Stomatol Croat* 2020 Mar;54(1):22-31.
 - › Linde L. Magical attachment: Children in magical relations with hospital clowns. *Int J Qual Stud Health Well-being* 2012;7.
 - › Louie D, Brook K, Frates E. The laughter prescription: a tool for lifestyle medicine. *Am J Lifestyle Med* 2016 Jun 23;10(4):262-267.
 - › Markova G, Houdek L, Kocabova Z. To the Operating Room! Positive Effects of a Healthcare Clown Intervention on Children Undergoing Surgery. *Front Public Health* 2021 Apr 20;9.
 - › Messina M, Molinaro F, Meucci D, Angotti R, Giuntini L, Cerchia E, Bulotta AL, Brandigi E. Preoperative distraction in children: hand-held videogames vs clown therapy. *Pediatr Med Chir* 2014 Sep-Dec;36:5-6.
 - › Miller M, Fry WF. The effect of mirthful laughter on the human cardiovascular system. *Medical Hypotheses* 2009.
 - › Mittal R, Sharma M. Assessment of psychological effects of dental treatment on children. *Contemp Clin Dent* 2012 Apr;3(1):2-7.
 - › Morgan GA, Rodd H, Porrit J, Baker S, et al. Children's experiences of dental anxiety. *Int J Paediatr Dent* 2016. 27(2):87-97.
 - › Muris P, Ollendick TH. The assessment of contemporary fears in adolescents using a modified version of the Fear Survey Schedule for Children-Revised. *J Anxiety Disorders* 2002;567-584.
 - › Norris M, Lecavalier L. Evaluating the use of exploratory factor analysis in developmental disability psychological research. *J Autism Dev Disord* 2010 Jan;40(1):8-20.
 - › Paglia L, Gallus S, de Giorgio S, Cianetti S, Lupatelli E, Lombardo G, Montedori A, Eusebi P, Gatto R, Caruso S. Reliability and validity of the Italian versions of the Children's Fear Survey Schedule - Dental Subscale and the Modified Child Dental Anxiety Scale. *Eur J Paediatr Dent* 2017 Dec;18(4):305-312.
 - › Paglia L. Dental fear in Italy: what is going on. *Eur J Paediatr Dent* 2016;17(4):257.
 - › Pani SC, AlAnazi GS, AlBaragash A, AlMosaihel M. Objective assessment of the influence of the parental presence on the fear and behavior of anxious children during their first restorative dental visit. *J Int Soc Prev Community Dent* 2016 Aug;6:148-52.
 - › Radomski AD, Wozney L, McGrath P, Huguet A, Hartling L, Dyson MP, Bennett KJ, Newton AS. Potential Reduction of Symptoms With the Use of Persuasive Systems Design Features in Internet-Based Cognitive Behavioral Therapy Programs for Children and Adolescents With Anxiety: A Realist Synthesis. *JMIR Ment Health* 2019 Oct 23;6(10).
 - › Rantavuori K, Tolvanen M, Hausen H, Lahti S, Seppä L. Factors associated with different measures of dental fear among children at different ages. *J Dent Child* 2009;76:13-19.
 - › Saliba FG, Adiwardana NS, Uehara EU, Silvestre RN, Leite VV, Faleiros FTV, Padovani FHP, Gobbi JIF. Salivary Cortisol Levels: the Importance of Clown Doctors to Reduce Stress. *Pediatr Rep* 2016 Mar;8.
 - › Scandurra C, Gasparro R, Dolce P, Bochicchio V, Muzii B, Sammartino G, Marenzi G, Maldonado NM. The role of cognitive and non-cognitive factors in dental anxiety: A mediation model. *Eur J Oral Sci* 2021 Aug;129(4):e12793.
 - › Schuurs AH, Hoogstraten J. Appraisal of dental anxiety and fear questionnaires: a review. *Community Dent Oral Epidemiol* 1993;21:329-339.
 - › Sharath A, Rekka P et al. Children's behavior pattern and behavior management techniques used in a structured postgraduate dental program. *J Indian Soc Pedod Dent Prev* 2009;27:22-26.
 - › Vieson RA, Silvestro JR. Psychological tests as predictors of children's operatory behavior. *ASDC J Dent Child* 1983 Jul-Aug;50(4):278-82.
 - › Yon MJY, Chen KJ, Gao SS, Duangthip D, Lo ECM, Chu CH. An introduction to assessing dental fear and anxiety in children. *Healthcare (Basel)* 2020 Apr 4;8(2):86.