Bait The Hook- Let the Fish Take a Bite Out of Anxiety

C. Chrishantha Joybell

Department of Pedodontics and preventive dentistry, Rajas Dental College and Hospital,
Tirunelveli 627105, Tamil Nadu, India.
chrishanthajoybell@gmail.com

Abstract:

Background: Understanding the immature emotion of the child is highly useful to study and select the most appropriate behaviour management strategy during a dental appointment. Anxiety may present as fear or worry, but can also make children irritable and angry. One of the main causes of cancelled appointments or lack of interest in dental treatment is avoidance behaviour in a child which in turn generates tooth decay, decreased self-esteem, and poor quality of life.

Aim of the study: The purpose of this study was to determine the anxiety levels of pediatric patients visiting the dental OP at a dental college and hospital, Kavalkinaru. This study unveils the novel technique where in fishes were used in the form of **CHRIS'S Fish Assisted Therapy** to reduce the anxiety in pediatric dental patients.

Results: Results showed that intervention with fish through the **CHRIS'S Fish Assisted Therapy** significantly reduced the anxiety levels in children.

Conclusion: Thus, CHRIS'S Fish Assisted Therapy is shown to be a promising method of anxiety control, a key to a successful pediatric dental practice.

Keywords: Dental anxiety, Dental fear, First dental visit, Pediatric dentistry, Non pharmacological behaviour management.

INTRODUCTION:

To a child a dental office can be a pretty scary place. Sometimes a child's fear is due to a previous dental experience, perhaps they overheard someone else recounting an unpleasant visit, or maybe they just have a fear of the unknown that intensifies when they see any frontline healthcare worker. With some children, no amount of persuasion can convince them to cooperate during their dental care visits, not even a few sleepless nights of pain. Even a seasoned dentist, using all of their trusted strategies, may eventually meet their match. To protect their long-term mental health, the dentistry of today does not forcefully restrain a child in order to deliver care.

Dealing with children effectively while creating a positive experience can be challenging. A skillful practitioner needs to be able to accurately evaluate a child's developmental level, temperament and coping skills then use the appropriate balance of patience and firmness all within a child's first visit. They must be careful not to trigger more fear since they know that most children will shut down further and become more unmanageable.

Forming a bond of trust with the child, no matter how little, is key to laying down the foundation for their future care and building self-confidence in a child. Sometimes it take many short, positive visits – each interaction an opportunity to tear down the walls of mistrust and fear – before a child becomes comfortable with a new dentist and their staff. Each step forward deserves recognition and should be rewarded with positive reinforcements.

Efficient and effective dental care instils positive dental attitude in children. This is possible with the refinement of the attitude of the dentist and redefinition of the work place. Understanding the immature emotions of the children is the initial step towards refining the dentist's attitude.

Behaviour of a child is a composite reflection of immature emotions or feelings. A child's behavioural presentation is influenced by the multitude of immature emotions including fear, anxiety, cry, phobia and anger. Dental fear and anxiety (DFA) is one of the major challenges encountered in pediatric dentistry[1]. Fear or refusal of dental treatment is a negative emotional reaction manifested by cognitive, physiological, and motor responses, which, when associated with dental visits or dental treatment, is referred to as dental anxiety[1].

Non-pharmacological management techniques (tell–show–do technique, voice control, non-verbal communication, positive reinforcement, distraction, coping, audio analgesia) are commonly used by the pediatric dentists when the child refuses to cooperate for the dental treatment. When all the Non-pharmacological management techniques fail, dentists resort to the Pharmacological management either with nitrous oxide sedation and general anaesthesia. Though full mouth rehabilitation under General Anaesthesia is absolutely safe, many parents hesitate to accept it.

Modifying the dental environment through both sounds and lights specifically designed for helping pediatric patients can alter the behaviour of the child patient. The pediatric dental set up should attend to the emotional immaturity of the children. The children may have a relaxing experience and carry pleasant memories of the clinic back home.

Animal-Assisted Activities (AAA) are the informal activities that involve human–animal interactions, promoting socialization, motivation, education, recreation, and other therapeutic benefits. Animal-assisted therapy aims at improving individual's mental or physical health. **Animal-Assisted Therapy (AAT)** is a therapeutic modality to improve human functioning in patients with acute or chronic diseases. These therapeutic modalities that use animals for improving the overall cognitive/social functioning of humans are called **Animal-Assisted Interventions (AAIs)**[2].

Research carried out in back in 2005 found that "contact with nature may provide an effective population-wide strategy in prevention of mental ill health".

This study unveils the novel technique wherein fish was used in the form of CHRIS'S **Fish Assisted Therapy (named after the Author)** to reduce the anxiety in pediatric dental patients. [**FIGURE 1 & 2**]. There are no previous studies of this kind available in literature and this present study is a novel technique.

Figure 1- CHRIS'S FISH Assisted Therapy

Figure 2- Intervention with Fish

CHRIS'S FISH Assisted Therapy:

"Life is like a sea of fish; you never know what you gonna catch."

It has been proven, that keeping fish improves mental health and also helps to reduce anxiety. Research carried out by Plymouth University discovered that just watching fish in an aquarium 'led to noticeable reductions in participant's blood pressure and heart rate.'

Aim & Objective:

This original research study was conducted to evaluate the effect of CHRIS'S Fish-Assisted Therapy for pediatric patients who are anxious during dental visits.

MATERIALS AND METHODS:

Fifty healthy children, 25 males and 25 females between the age group 5-10 years, visiting the Department of Pedodontics, at a dental college and hospital were randomly selected for the study.

Verbal and written consent was obtained from the parents or the guardian of the child before the start of the study. Institutional ethical committee clearance was obtained from the Institutional review board with reference number as follows: **RDCH/ PRL/ IRB/ 0-3569/2023.**

Children who had expressed apprehension (stress, anxiety, fear) when going to the dentist were included in the study. Only children visiting the dentist for the first time and children who are to undergo preventive dental procedures such as fluoride application and pit and fissure sealant, oral prophylaxis, restorative procedures were selected for the study.

Children who had fear of fishes (fear when talking about fishes and seeing the fishes) were excluded from the study. Special children who had low levels of IQ (Wechsler Intelligence Scale for Children (WISC) below value of 80) were also excluded from the study.

A blue colored healthy Betta fish which was veterinarian certified was selected for the CHRIS'S Fish Assisted Therapy. It was placed in a medium sized fish bowl [**FIGURE 3,4**]. The fish were fed with healthy food that contains fish meal, wheat flour, corn, corn gluten soybean meal, shrimp meal, spirulina, fish oil, vitamins and minerals [**FIGURE 5,6**]. The fish was fed 2-3 times daily. Food was sprinkled just that it was enough for the fish to consume the food within 15 minutes. Care was taken that the fish was not overfed, because overfeeding will reduce the quality of the water and it may be detrimental to the fish.
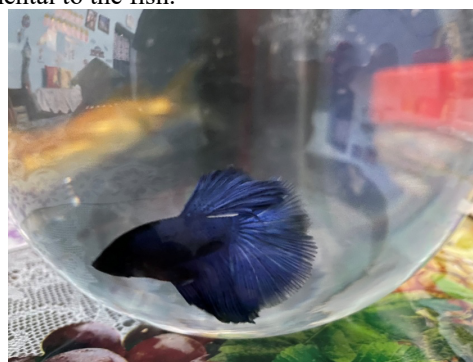

Figure 3- Betta fish

Figure 4- Betta fish in a fish bowl

Figure 5- Fish food

Figure 6- Fish food ingredients

Care was taken to ensure that water was replaced once in a week and the bowl was clean simulating a clean and healthy environment for the fish. An artificial plant was placed inside the fish bowl to simulate a natural environment look.

Bettas are well known for being highly territorial, with males prone to attacking each other if housed in the same tank; without a means of escape, this will usually result in the death of one or both fish. So a single blue coloured Betta fish was chosen for the study. Bettas are exceptionally tolerant of low oxygen levels and poor water quality, owing to their special labyrinth organ a unique characteristic feature that allows for the intake of surface air. In addition to its worldwide popularity, the Siamese fighting fish is the National aquatic animal of Thailand.

During the intervention, the fish bowl was placed on a clean table next to the dental chair; at the beginning, midpoint and at the end of the intervention.

The MCDAS (Modified Corah's Dental Anxiety Scale)
The MCDAS (Modified Corah's Dental Anxiety Scale) is a reliable and valid measure of dental anxiety in children. It comprises of a set of 6 questions that helps us determine how the child feels during a dental visit. The scoring for each question is mentioned in the Figure 7. Scores below 19 indicates the absence of state anxiety, scores higher than 19 indicates the presence of state anxiety and scores higher than 31, indicates severe phobic disorder. Before and after the dental procedure- MCDAS scores were obtained. [**FIGURE 7].**

Figure 7 - SET OF QUESTIONS IN MCDAS SCALE

Dental Anxiety- RMS pictorial scale (Ragavendra-Madhuri- Sujatha)[FIGURE 8,9,10]
Raghavendra, Madhuri, Sujata (RMS) Pictorial Scale (RMS-PS) which is a validated scale, is used for the assessment of child's dental anxiety. RMS-PS comprises a row of faces ranging from very happy to very unhappy [**Figure 8].** Two separate sets of photographs were used for boys [**Figure 9]** and girls [**Figure 10].** The children were asked to choose the face they feel like about themselves at that moment. The scale was scored by giving a value of one to the very happy face and five to the very unhappy face.
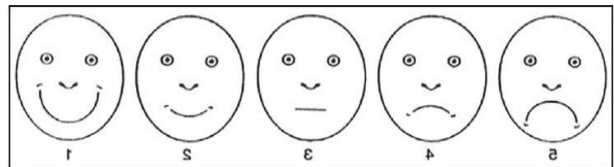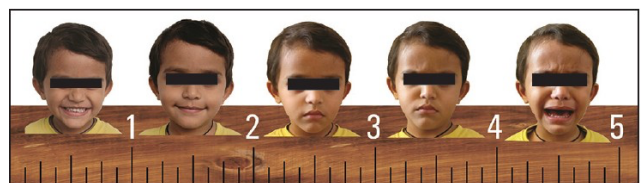

Figure 8- RMS PICTORIAL SCALE

Figure 9 - RMS PICTORIAL SCALE FOR BOYS

Figure 10- RMS PICTORIAL SCALE FOR GIRLS

Heart Rate:
Physiological measurement (heart rate) before, during and at the end of the intervention with fish were measured using Pulsoximeter. [**FIGURES 11- 16]**

Figure 11- Pulsoximeter

Figure 12- Pulsoximeter demonstrated to a patient

Figure 13- Pulsoximeter reading in a patient

Figure 14- Measurement of Heart Rate

Figure 15- Measurement of heart rate using a pulsoximeter

Figure 16- Dental treatment with Fish Assisted Therapy

Sample of Patient Consent Form:

I have read the information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study. I understand that my participation is voluntary, that i can choose not to participate in part or all of the project and that I can withdraw at any stage of the project without being penalised. My child is not fearful to fishes. I hereby give my consent and authorise the observer to use images and related information of my child. I understand that my name and identity will not be disclosed. once signed, I cannot revoke my consent.

Name of Participant_____

Signature of Parent/ Guardian of the child _____

Date _____

Statistical Analysis:

The Normality tests Kolmogorov-Smirnov and Shapiro-Wilks tests results reveal that variables (MCDAS and RMS scales) do not follow Normal distribution. Therefore, to analyse the data, non-parametric methods are applied. To compare MCDAS and RMS scales between genders independent samples Mann Whitney U test is applied.

To compare MCDAS and RMS scales between age groups, independent samples Kruskal Wallis test is used followed by Bonferroni corrected Mann Whitney test for multiple pair wise comparison. To compare MCDAS and RMS scales between before and after experiment related samples Wilcoxon Signed Rank test is used.

To compare MCDAS and RMS scales between before, during and after experiment related samples Friedman's Two-Way Analysis of Variance followed by Bonferroni corrected Wilcoxon Signed Rank test for multiple pair wise comparison. To compare proportions between study and control groups Chi-Square test is applied, if any expected cell frequency is less than five then Fisher's exact test is used.

To compare proportions between two time points McNemar's Chi-Square test is employed. To analyse the data SPSS (IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp. Released 2019) is used. Significance level is fixed as 5% ($\alpha = 0.05$). **(If P-Value is<0.05 then statistically significant)**

RESULTS:

In our present study, 50% of the children were males and 50% were females. 30% were between 5-7 yrs, 44% between 7.1- 9 yrs and 26% between 9.1- 10 yrs.

There was a significant reduction in anxiety of patients after intervention with fishes according to the MCDAS scale with a significant p value of <0.001 according to the Wilcoxon Signed Rank Test. The reduction in anxiety was seen in all age groups and both male and female patients.

Related-Samples Friedman's Two-Way Analysis of Variance was used to compare the total RMS scale before, during and after intervention it was statistically significant with a p value of <0.001. Bonferroni corrected pairwise comparisons of RMS scale showed that after intervention with fish, there was a significant reduction in anxiety with a statistical significance of p value <0.001

Gender wise comparison of total RMS scale using Related-Samples Friedman's Two-Way Analysis of Variance and Independent-Samples Mann-Whitney U Test showed that there was statistically significant reduction in anxiety of male and female patients after intervention with Fish Assisted Therapy.

Children of age group between 5-7 yrs showed a marked reduction in anxiety after intervention with fishes and it was statistically significant with a p value of <0.001.

TABLE 1: GENDER WISE COMPARISON OF TOTAL MCDAS SCALE

Total MCDAS Scale		Before	After	p-value*
Male	N	25	25	<0.001
	Median	22.0	13.0	
	1st Quartile	15.0	9.0	
	3rd Quartile	34.0	17.2	
	Mean	23.1	13.4	
	Std Dev	10.0	5.7	
Female	N	25	25	<0.001
	Median	22.0	11.0	
	1st Quartile	13.0	9.0	
	3rd Quartile	29.0	14.1	
	Mean	22.4	12.4	
	Std Dev	10.1	4.7	
p-value@		0.838	0.558	

* Related-Samples Wilcoxon Signed Rank Test
@Independent-Samples Mann-Whitney U Test
Before- Before intervention with Fish Assisted Therapy
After- After intervention with Fish Assisted Therapy

TABLE 2: AGE GROUP WISE COMPARISON OF TOTAL MCDAS SCALE

Total MCDAS Scale		Before	After	p-value*
5.0 - 7.0 yrs	N	15	15	<0.001
	Median	33.0	17.0	
	1st Quartile	21.0	12.0	
	3rd Quartile	39.0	20.0	
	Mean	29.5	16.4	
	Std Dev	9.9	4.8	
7.1 - 9.0 yrs	N	22	22	0.001
	Median	23.0	12.0	
	1st Quartile	20.0	11.0	
	3rd Quartile	29.0	15.0	
	Mean	24.0	13.4	
	Std Dev	7.8	4.8	
9.1 - 10.0 yrs	N	13	13	1.000
	Median	12.0	7.0	
	1st Quartile	11.0	6.0	
	3rd Quartile	15.0	9.0	
	Mean	12.8	7.9	
	Std Dev	4.0	2.2	
p-value#		<0.001	<0.001	

*Related-Samples Wilcoxon Signed Rank Test
#Independent-Samples Kruskal-Wallis Test
Before- Before intervention with Fish Assisted Therapy
After- After intervention with Fish Assisted Therapy

TABLE 3: BONFERRONI CORRECTED PAIRWISE COMPARISONS OF TOTAL MCDAS SCALE

Pairs (Age group)	Before	After
9.1 - 10.0 yrs vs 7.1 - 9.0 yrs	0.001	0.001
9.1 - 10.0 yrs vs 5.0 - 7.0 yrs	<0.001	<0.001
7.1 - 9.0 yrs vs 5.0 - 7.0 yrs	0.511	0.382

Before- Before intervention with Fish Assisted Therapy
After- After intervention with Fish Assisted Therapy

TABLE 5: AGE GROUP WISE COMPARISON OF TOTAL RMS SCALE

RMS Scale		Before	During	After	p-value$^\$$
5.0 - 7.0 yrs	N	15	15	15	<0.001
	Median	3.0	1.0	1.0	
	1st Quartile	3.0	1.0	1.0	
	3rd Quartile	3.0	2.0	1.0	
	Mean	2.9	1.4	1.0	
	Std Dev	.6	.6	.0	
7.1 - 9.0 yrs	N	22	22	22	0.051
	Median	1.0	1.0	1.0	
	1st Quartile	1.0	1.0	1.0	
	3rd Quartile	2.0	1.0	1.0	
	Mean	1.4	1.2	1.0	
	Std Dev	.5	.4	.0	
9.1 - 10.0 yrs	N	13	13	13	1.000
	Median	1.0	1.0	1.0	
	1st Quartile	1.0	1.0	1.0	
	3rd Quartile	1.0	1.0	1.0	
	Mean	1.0	1.0	1.0	
	Std Dev	.0	.0	.0	
p-value$^\#$		<0.001	0.071	1.000	

$^\$$Related-Samples Friedman's Two-Way Analysis of Variance
$^\#$Independent-Samples Kruskal-Wallis Test
Before- Before intervention with Fish Assisted Therapy
After- After intervention with Fish Assisted Therapy

TABLE 5: MCNEMAR'S CHI-SQUARE TEST TO COMPARE HEART RATE BETWEEN TIME POINTS: AGE GROUP WISE

Age group	Heart Rate		Heart Rate: Before						p-value
			Normal		High		Total		
			N	%	N	%	N	%	
5.0 - 7.0 yrs	During	Normal	2	66.7%	9	75.0%	11	73.4%	0.021
		High	1	33.3%	3	25.0%	4	26.7%	
		Total	3	100.0%	12	100.0%	15	100.0%	
	After	Normal	3	100.0%	11	91.7%	14	93.3%	0.001
		High	0	0.0%	1	8.3%	1	6.7%	
		Total	3	100.0%	12	100.0%	15	100.0%	
7.1 - 9.0 yrs	During	Normal	10	100.0%	8	66.7%	18	81.9%	0.008
		High	0	0.0%	4	33.3%	4	18.2%	
		Total	10	100.0%	12	100.0%	22	100.0%	
	After	Normal	10	100.0%	10	83.3%	20	90.9%	0.002
		High	0	0.0%	2	16.7%	2	9.1%	
		Total	10	100.0%	12	100.0%	22	100.0%	
9.1 - 10.0 yrs	During	Normal	10	100.0%	3	100.0%	13	100.0%	-
		High	0	0.0%	0	0.0%	0	0.0%	
		Total	10	100.0%	3	100.0%	13	100.0%	
	After	Normal	10	100.0%	3	100.0%	13	100.0%	-
		High	0	0.0%	0	0.0%	0	0.0%	
		Total	10	100.0%	3	100.0%	13	100.0%	

Age group	Heart Rate		Heart Rate: After						p-value
			Normal		High		Total		
			N	%	N	%	N	%	
5.0 - 7.0 yrs	During	Normal	11	78.6%	0	0.0%	11	73.4%	0.250
		High	3	21.4%	1	100.0%	4	26.7%	
		Total	14	100.0%	1	100.0%	15	100.0%	
7.1 - 9.0 yrs	During	Normal	18	90.0%	0	0.0%	18	81.9%	0.500
		High	2	10.0%	2	100.0%	4	18.2%	
		Total	20	100.0%	2	100.0%	22	100.0%	
9.1 - 10.0 yrs	During	Normal	13	100.0%	0	0.0%	13	100.0%	-
		High	0	0.0%	0	0.0%	0	0.0%	
		Total	13	100.0%	0	0.0%	13	100.0%	

Before- Before intervention with Fish Assisted Therapy
After- After intervention with Fish Assisted Therapy
 Normal heart rate was considered as 70- 110 beats per minute

DISCUSSION:

Despite the advances in dental care, encountering anxiety and its management remains a challenge to the pediatric dentist. Barlow has described anxiety as"a unique and coherent cognitive-affective structure within our defensive and motivational system[3]." There are multiple manifestations and impacts of dental fear and anxiety, including immediate physical reactions (e.g., crying, screaming, and shivering), psychological responses (e.g., worry, upset, panic, helplessness, insecurity, resentment, and hatred), and uncooperativeness in dental treatment[4].

The injection is associated with the psychological pain rather than physical pain. Injections have been voted as the most anxiety provoking procedure in a pediatric dental procedure. Children express immature emotions such as fear, anxiety, cry at the sight of the needle rather than the prick of the needle.

In addition to the relatively simple techniques such as providing information, tell-show-do, and signaling, there are several psychological approaches to manage dental anxiety and fear which can be used in the clinic. These range in complexity from those that are relatively easy to carry out to others requiring specialized training[5].

Externalisation is the process in which the child's attention is focused away from the stressful emotions/ distressed stimuli associated with the dental treatment. One way to carry out this de- emphasis method is distraction. The child is distracted from the stimuli presented during the dental procedure by presenting a more exciting stimulus.

The results though are obtained from the dental environment are comparable to those obtained in other health-care environment since this is first reported study of its kind such as research in the University of California showing lower anxiety levels when compared to a control group[6,7], and Shiloh et al [8] also showed significant improvement in anxiety when petting a live animal rather than a toy, with this effect not affected by people's attitude toward animals. Significant reduction in anxiety was also noted in acute schizophrenic patients by Lang et al [9] and Berget et al. (2008)[10] had also shown that exposure of psychiatric patients to farm animals where the activities included feeding and physical contact resulted in improvement on self-efficacy and coping ability.

Significant reduction in levels of cortisol that is secreted in response to stressful stimuli was also noted when children were subjected to AAI[11]. It has also been noted that there is a reduction of stress hormones, such as epinephrine and norepinephrine, as well as increases in endorphin levels[12]. Oxytocin also offers antistress effects and increases pain threshold, and oxytocin levels have been shown to increase following therapy pet visits[13,14].

Researchers from Deakin University, Melbourne have suggested that, contact with nature can provide an effective population wide strategy in prevention of mental health. One such contact with nature can be keeping fish and caring for them. Keeping fish is also shown to be an effective therapy in the treatment of disruptive behaviour disorders in children.

Researchers from the Plymouth University and the University of Exeter discovered that watching fish in aquariums led to noticeable reduction in participant's heart rate and blood pressure.

Fishes have been shown to help people with Alzheimer's. A study done in 90's showed that displaying aquariums with brightly colored fishes helped to reduce the disruptive behaviour of Alzheimer patients. These patients displayed less physical aggression and generally ate better after an aquarium was placed in their dining room.

Researchers from the Mayo clinic claim that keeping fish can help to improve mental health and reduce anxiety.

Researchers from the University of Pennsylvania stated that keeping fish can be an effective therapy in the treatment of disruptive behaviour disorders in children.

During a study at the National Marine Aquarium, England, participants who viewed aquariums reported greater increase in self reported mood. The more vibrant colored fishes help to provide the best results. Any aquarium from large to small will have benefits in improving the mood.

The concept of biophilia [15] is frequently called upon to provide a partial explanation of the beneficial effects associated with HAI. Wilson (1984) described biophilia as humans' "innate tendency to focus on life and lifelike processes". The evidence of human interest in and interaction with nature appears in the form of national parks, zoos and aquaria, public and private botanical gardens, and the practice of keeping indoor plants and pets at home[16].

In our present study, we had evaluated 50 healthy children between the age group of 5- 10 years . In our present study, on comparison of MCDAS scores before and after intervention with fish, there was a statistically significant reduction in the anxiety of children with a p value of <0.001(**TABLE 1- 3**). Children who are between the age group of 5-7 yrs showed a statistically significant reduction in the anxiety levels when compared to the children who were older than 7 years. Considering the RMS pictorial scale, most of the children visiting the dental operatory came with a unhappy face. After intervention with fish, the face of most of the children changed to a smile which was also statistically significant (**TABLE 4**).

The normal heart rate for children is 70 to 110 beats per minute. When there is a 20% increase in the normal heart rate, it is considered as high. Before the start of the dental procedure, the children had an increased heart rate but during the procedure while the fish were placed next to the dental chair, the heart rate significantly reached normal for most of the children. There was a statistically significant reduction in the anxiety of children during the dental procedure and after the dental procedure with a p value of <0.001 (**TABLE 5**).

Observing fish is a very different style of human-animal interaction as compared to interacting with other mammals. There is no way to safely hold or pet a fish; rather, one must observe the fish in an aquarium or another body of water. This does not mean, however, that

humans do not form connections to these fish. Indeed, a large number of individuals who own fish as pets become very attached to them, and along with the worldwide popularity of public aquaria, this indicates that fish fall well within the human attraction to nature as posited by the biophilia thesis[17].

CONCLUSION:

The study revealed that watching fishes was beneficial and it improved the study participant's moods by reducing anxiety and depressive symptoms as well as paranoid symptoms. Using fishes as a background landscape could open new therapeutic possibilities in dental clinics, to reduce the anxiety among child dental patients. This study unveils the novel technique wherein fish was used in the form of CHRIS'S **Fish Assisted Therapy** to reduce the anxiety in pediatric dental patients.

REFERENCES:

1. Eden E., Sevinç N., Akay A., Kilinç G., Ellidokuz H. Evaluation of children's dental anxiety levels at a kindergarten and at a dental clinic. *Braz. Oral Res.* 2016;30:1–8. [PubMed] [Google Scholar].
2. Serpell JA. Animal Assisted Therapy- Conceptual model and guidelines for quality assurance. In: Fine AH, editor. Handbookon Animal-Assisted Therapy: Theoretical Foundations and Guidelines for Practice. Second ed. United States of America: Elsevier Publications; 2011. p.119-64.
3. Steimer T. The biology of fear-.and anxiety-related behaviors. Dialogues Clin Neurosci 2002;4:231-49.
4. Gao X, Hamzah SH, Yiu CK, McGrath C, King NM. Dental fear and anxiety in children and adolescents: Qualitative study using YouTube. J Med Internet Res 2013;15:e29.
5. Armfield JM, Heaton LJ. Management of fear and anxiety in the dental clinic: A review. Aust Dent J 2013;58:390-407.
6. Marcus DA. The science behind animal-assisted therapy. Curr Pain Headache Rep 2013;17:322.
7. Marcus DA, Bernstein CD, Constantin JM, Kunkel FA, Breuer P, Hanlon RB, *et al*. Impact of animal-assisted therapy for outpatients with fibromyalgia. Pain Med 2013;14:43-51.
8. Shiloh S, Sorek G, Terkel J. Reduction of state-anxiety by petting animals in a controlled laboratory experiment. Anxiety Stress Coping 2003;16:387-95.
9. Lang UE, Jansen JB, Wertenauer F, Gallinat J, Rapp MA. Reduced anxiety during dog assisted interviews in acute schizophrenic patients. Eur J Integr Med 2010;2:123-7.
10. Berget B, Ekeberg O, Braastad BO. Animal-assisted therapy with farm animals for persons with psychiatric disorders: Effects on self-efficacy, coping ability and quality of life, a randomized controlled trial. Clin Pract Epidemiol Ment Health 2008;4:9.
11. Vagnoli L, Caprilli S, Vernucci C, Zagni S, Mugnai F, Messeri A, *et al*. Can presence of a dog reduce pain and distress in children during venipuncture? Pain Manag Nurs 2015;16:89-95.
12. Odendaal JS, Meintjes RA. Neurophysiological correlates of affiliative behaviour between humans and dogs. Vet J 2003;165:296-301.
13. Mease PJ. Further strategies for treating fibromyalgia: The role of serotonin and norepinephrine reuptake inhibitors. Am J Med 2009;122:S44-55.
14. Beetz A, Uvnas-Moberg K, Julius H, Kotrschal K. Psychosocial and psycho physiological effects of human-animal interactions: The possible role of oxytocin. Front Psychol 2012;3:234.
15. Wilson E.O. Biophilia. Harvard University Press; Cambridge, MA, USA: 1984. [Google Scholar]
16. Gullone E. The Biophilia Hypothesis and Life in the 21st Century: Increasing Mental Health or Increasing Pathology? J. Happiness Stud. 2000;1:293–322. doi: 10.1023/A:1010043827986. [CrossRef] [Google Scholar]
17. Gee NR, Reed T, Whiting A, Friedmann E, Snellgrove D, Sloman KA. Observing Live Fish Improves Perceptions of Mood, Relaxation and Anxiety, But Does Not Consistently Alter Heart Rate or Heart Rate Variability. Int J Environ Res Public Health. 2019 Aug 27;16(17):3113. doi: 10.3390/ijerph16173113. PMID: 31461881; PMCID: PMC6747257.