

Dental Hypnosis Effectiveness to Cortisol Levels As Dental Anxiety Biomarker and Its Correlation with QoL

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Abstract

Dental anxiety is a psychophysiological response that may occur in a dental treatment. Therapies can be pharmacological and non-pharmacological. Non-pharmacological therapy emphasizes to control patient's subconsciousness, known as Dental Hypnosis. This research aimed to analyze the effectiveness of Dental Hypnosis on reducing dental anxiety using salivary cortisol levels as a biomarker and its correlation with QoL. This was a clinical experimental study with a single-blind randomized controlled trial design, involving forty-six patients with dental anxiety from the Special Care Clinic of Padjadjaran University Dental Hospital, from January to July 2015. There were two stages of research; the first was the MDAS and intervention's tools validations until Dental Hypnosis script was produced. The second was intervention implementation in two groups, Dental Hypnosis and Dental Inhalation Conscious Sedation group, the control group. Dental Hypnosis group showed a significant decrease in salivary cortisol levels compared to the control group. Dental Hypnosis was more effective to reduce salivary control levels compared to the control group. There was a significant correlation between Dental Hypnosis to minimize the OHRQoL-23 index score, patient's QoL indicator. Dental Hypnosis was effective to reduce salivary cortisol levels and had a significant correlation with QoL improvement in patients with dental anxiety.

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Introduction

Dental anxiety is defined as a specific concern that may occur before or during dental treatment, and distinct from fear.¹ Dental anxiety phenomenon is common and has been widely studied, for example in the US (2012), Brazil (Mehboob et al, 2011), and Bulgaria (Mehboob et al, 2011).² In Indonesia, there is no officially published national data on dental anxiety prevalence, but a research in 2014 showed 53 out of 98 tooth extraction patients had dental anxieties.³

Dental anxiety stimulates psychophysiological response, during or before dental treatment.^{1,4} Dental anxiety activates the

sympathetic nervous system and the Hypothalamus-Pituitary-Adrenal Axis (HPA), which then stimulates stress hormones secretion, such as cortisol, an indicator when someone feels anxiety.⁵ It may occur due to psychological trauma caused by unpleasant experiences during dental treatment and poor dental habits, such as only visiting the dentist during emergencies or suggestions from other people, which may lead to worse oral health condition. Patients' reluctance to seek dental treatment due to dental anxiety may worsen their oral health and affect their oral health related quality of life.⁶

Both pharmacological therapy using anti-anxiety drugs, such as Dental Inhalation Conscious Sedation, and non-pharmacological therapy by controlling patient's subconscious behavior, known as Behavior Medicine (BM), has been done to reduce anxiety level.¹ Behavior Medicine applies behavioral science for preventions, diagnoses, treatments, rehabilitations, and the maintenance of health. Dental hypnosis is one type of non-

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pharmacological Behavior Medicine Intervention, which is an intervention to change beliefs about illness, disability, and above all, adaptation to pain.⁷

Dental hypnosis is a similar state to sleep or a state when the mind is in a subconscious state, but the patient can still interact with a hypnotherapist. Words and instructions are obeyed and listened by the patient, increasing patient's acceptance to the suggestions and ideas given by the hypnotist.⁸ Dental hypnosis is a structured communication between a dentist and a patient aimed to bring a patient into a subconscious state using, making a patient much more relaxed and calmer, and increasing patient's tolerance threshold. Dental Hypnosis is recommended to be an adjunct of non-pharmacological therapy for dental anxiety.⁹

This research aimed to analyze the effectiveness of dental hypnosis on dental anxiety using salivary cortisol levels as a biomarker and its relation to the quality of life.¹⁰

Materials and methods

This was a clinical experimental study with a single-blind randomized controlled trial design, involving 46 patients with dental anxiety from Special Dental Care Clinic of Dental Hospital of Faculty of Dentistry, Padjadjaran University, who met the criteria, taken from January to July 2015.

This research was conducted in two stages; the first stage was the validation of the Modified Dental Anxiety measuring scale and the Dental Hypnosis-Hypnodontic Communication intervention script module and the second stage was the implementation to the participants. The participants were divided into two groups, the first group was the treatment group using Dental Hypnosis-Hypnodontic Communication and the second group was the control group using Dental Inhalation Conscious Sedation prior to the tooth extraction. Preliminary study was conducted to obtain preliminary data on how many patients had moderate to high dental anxiety, using Galvanic Skin Response (Figure 1) and validated Modified Dental Anxiety measuring scale.

Salivary samples were then taken to measure the salivary cortisol hormone levels as the dental anxiety biomarker prior to the intervention, followed by the quality of life measurement using OHRQoL-23 index. Salivary samples were then taken again after the

intervention and the quality of life was reassessed one week later. Salivary cortisol levels were measured using Enzyme-Linked Immunosorbent Assays (ELISA).⁵



Figure 1. GSR and How to Use It.

Dental hypnosis technique involved two stages; the first stage was the pre-induction stage, the process of conductive condition preparations, including introducing, informing dental hypnosis benefits, and convincing whether the participants really wanted to be hypnotized or not, followed by informed consent. Prior to the second stage, it was important for the participants to be in a comfortable condition. The second stage was the induction stage, to bring someone from conscious mind to subconscious mind using simple and easily understood verbal language. After the dental treatment, before waking the participants, the therapists gave post hypnosis suggestions to restore the participant's condition to pre intervention condition.

OHRQoL-23 questionnaire was filled by the participants with the researcher assisting. Salivary samples were taken and noted by colleagues from the molecular biology clinic at Hasan Sadikin Hospital, Bandung. Dental sedation was carried by experts and dental hypnosis was carried by the researcher and a colleague, following the National Guild of Hypnosis, USA.

Statistical analyses used in this study were the Saphiro-Wilk to test the normality of samples, the Wilcoxon Rank Sign to analyze the differences in salivary cortisol levels before and after the interventions, the Mann-Whitney difference test to analyze the effectiveness difference between Dental Hypnosis-Hypnodontic Communication and Dental Inhalation Conscious Sedation, and the Spearman Rank Correlation to test the correlation between Dental Hypnosis-Hypnodontic Communication and the OHRQoL-23 index score.

This research was institutionally approved by Research Ethics Commission, Faculty of Medicine, Padjadjaran University, no. 246/UN6.C1.3.2/KEPK/PN/2015.

Results

In the pre-induction stage, assertions-statements speech acts were generally used. Table 1 showed speech acts in the pre-induction stage. In the induction stage, directives-commands and expressives-appraisings speech act generally used, so the patients would obey. Table 2 showed the types of speech acts in the induction stage, while table 3 showed language styles used in the speeches. Directives-commands speech act dominated the speech, and direct speeches used more often than the indirect speeches, aimed to prevent the ambiguity of directive commands taken. The reliability test for the Modified Dental Anxiety Scale was done with Alpha Cronbachs value of 0.942.

Types of Speech Acts	The Amount of Data
Assertions-Statements (declarative information)	8 data
Expressives - Appraisings (good)	1 data
Directives - Requests (request)	1 data

Table 1. Speech Acts Types on Introduction.

Types of Speech Acts	The Amount of Data
Assertions - Statements	20 data
Directives - Suggestions	05 data
Directives - Commands	18 data
Expressives - Appraisings	42 data
Expressives – Appraisings & Assertions-Statements	05 data
Assertions – Statements & Directives - Commands	01 data
Assertions – Statements & Expressives – Appraising & Assertives – Statements	06 data
Assertions – Statements & Expressive – Appraising & Directives – Commands & Assertions - Statements	03 data
Direct Command speech acts	14 data
Indirect Command speech acts	04 data
Direct Statements speech acts	18 data
Indirect Statements speech acts	04 data

Table 2. Speech Act Types on Suggestions.

Table 4 showed the characteristics of the participants, and the p values were greater than 0.05 ($p>0.5$), meaning that there were no differences in characteristics. The cortisol hormone levels were taken at the lowest cortisol

level, which was around 1-5 PM, with normal value of 64-327 nmol/L (2.3-11.9 $\mu\text{g/dL}$)¹¹. Table 5, the Wilcoxon Rank Sign Test, showed the salivary cortisol levels before and after the intervention, and there were significant differences in the decrease of salivary cortisol hormone levels in group 1, with p value of 0.000 ($p<0.05$). Meanwhile, the t-test in group 2 showed no difference in the decrease of cortisol hormone levels with a p value of 0.718 ($p>0.05$).

Types of Language Speech Acts	The Amount of Data
Climax Language Style (<i>making, semakin, terus</i>)	18 data
Parallelism Language Style (<i>besi-keras, sunyi-senyap, beku-kaku</i>)	12 data
Antithesis Language Style	05 data
Repetition Language Style	16 data

Table 3. Language Style Types.

Characteristics	Group		Value of p
	Dental Hypnosis (n = 23)	Dental Sedation (n = 23)	
1. Gender			0.5
Male	5 (21.7%)	7 (30.4%)	
Female	18 (78.3%)	16 (69.6%)	
2. Age (years)			0.66
Average \pm SD	29.87 \pm 7.15	29.00 \pm 6.33	
Median	32	31	
Range (min-max)	19 - 41	18-40	
3. Job			0.96
Student	6 (25%)	7 (30.4%)	
Civil Servant	3 (12.5%)	2 (8.7%)	
State Owned Company Worker	2 (8.3%)	2 (8.7%)	
Entrepreneur	12 (50%)	12 (52%)	
4. Education			0.55
Highschool	9 (39.13%)	12 (52.17%)	
Bachelor	14 (60.87)	11 (47.83%)	

Table 4. Participants Characteristics.

Note: Numeric data of p value on age were calculated based on ANOVA Test because the data were normally distributed. For categorical data on gender, occupation, and education, they were calculated based on the Chi-Square Non-Parametric Statistical Test.

Table 6 showed that there was a significant difference in the OHRQoL-23 index score, an indicator of the value of quality of life in group 1 with p value of 0.000 ($p<0.05$), but there was no significant difference in group 2 with p value of 0.093 ($p>0.05$). Table 7 showed p value of 0.000 ($p<0.05$), meaning that there was a significant difference. Table 8 showed a strong positive correlation between hypnosis and OHRQoL.

Group	Cortisol hormone levels ($\mu\text{g} / \text{dl}$)		Value of <i>p</i>
	Before	After	
Group 1. Dental Hypnosis			
The mean	14.94	11.09	0.000*
SD	.97	.82	
Group 2. Dental Sedation			
The mean	15.57	15.51	0.71**
SD	1.19	1.62	

Table 5. Average Salivary Cortisol Hormone Levels on Group 1 and 2.

Note: * WilcoxonRankSign Test ** T Test.

Group	OHRQoL-23		Value of <i>p</i>
	Before	After	
Group 1. Dental Hypnosis			
The mean	3.58	1.41	0.000*
SD	.21	0.46	
Group 2. Dental Inhalation Conscious Sedation			
The mean	3.56	3.61	0.09*
SD	.10	0.12	

Table 6. Analysis of OHRQoL-23 Index Score Differences.

Information:

OHRQoL-23 index:

$\geq 2,65$ = Disturbances in oral teeth disrupt quality of life

$\leq 2,65$ = Disturbances in oral teeth do not interfere with quality of life

* Wilcoxon Rank SignTest

Group	Cortisol hormone levels ($\mu\text{g} / \text{dl}$)			Value of <i>p</i>
	Before	After	Difference	
Group 1. Dental Hypnosis				
The mean	14.94	11.09	-3.65 \pm 1.23	
SD	.97	.82		
Group 2. Dental Inhalation Conscious Sedation				
The mean	15.57	15.51	-0.56 \pm 0.43	0.000
SD	1.19	1.62		

Table 7. Effectiveness of Interventions on Salivary Cortisol Hormone Levels Differences.

		Dental Hypnosis	OHRQoL-23 Index
Dental hypnosis	Correlation Coefficient	1,000	.87 **
	Sig. (2-tailed)	.	.000
Spearman's rho	N	46	46
	Correlation Coefficient	.871 **	1.000
OHRQoL-23 index	Sig. (2-tailed)	.000	.
	N	46	46

Tabel 8. Dental Hypnosis and OHRQoL-23 Index Correlation.

** . Correlation is significant at the 0.01 level (2-tailed).

Discussion

Discussions on the first stage focused on the analysis of linguistic strategies. Analysis showed that there were three speech acts in the hypnodontic communication, which were assertions, directives, and expressives. Assertions speech acts describe the speaker's beliefs that are adjusted to reality, aimed to inform people about a fact, an affirmation, a conclusion, and a description. Assertions speech acts are used for stating, suggesting, boasting, complaining, and claiming.¹²

In the preliminary stage, assertions-statements type of speech act were generally used, because it focused more on the initial information on the following actions. In general, assertions-statements speech acts are declarative sentences in the form of giving information.¹³ In an attempt to enter the hypnotized stage, a hypnodontist used directives-commands speech acts in the form of imperative sentences. A hypnodontist used expressives-appraisings speech acts each time the patient did the instructions in the form of declarative sentences, aimed to bring the patients deeper into their subconsciousness, done by shifting the perception of anxiety and pain to the perception of comfort.

There were also direct command speech acts in the form of imperative sentences. This kind of direct command would be successful, especially for people with high suggestibility or who had entered the hypnotized stage. Direct commands were easier to understand because there was no need to think about the intentions behind the speech. Direct statements speech acts aim to state something in the form of statements (affirmative), and there is no other purpose for the statement. Meanwhile, indirect statements speech acts aim to state something with a different meaning, which is to command, and in the form of statements (declarative). Thus, a statement can be used as a command in hypnodontic communication.¹⁴

There are four language styles used in hypnodontic communication, those were climax style, parallelism style, antithesis style, and repetition style. The climax style illustrated that thought sequences are gradually increasing. Keraf (2009) stated that climax was a kind of language style containing increasing thought sequences. Parallelism illustrated the

resemblance of elements in a construct, aimed to strengthen the suggestions given.¹² Antithesis language style contains contradicting ideas using contradicting words or group of words.¹⁵ Repetition language style contains repetition of words, group of words, whether in the beginning, middle, or the end of a sentence. Repetition is considered as one of the most important styles in the hypnodontic communication because repetitions strengthen and reinforce the suggestions given.

Discussions on the second stage focused on the dental hypnosis' effectiveness to decrease salivary cortisol hormone levels, an indicator of dental anxiety, and its correlation with the QoL based on the OHRQoL-23 index. Table 5, the distribution of participant's characteristics, showed that gender affected dental anxiety levels, whereas women had a higher dental anxiety compared to men, this in line with Carrillo Diaz (2000). This might be due to different perceptions and emotions between men and women.⁶ Respondents aged ≤ 35 showed greater dental anxiety than respondents aged >35 , in line with Sghaireen (2013) which stated that anxiety levels in people aged 20 - ≤ 35 were more than double than people aged $>35 - 40$.¹⁶

This study showed a significant decrease in salivary cortisol hormone by using dental hypnosis, with a p value of <0.001 ($P<0.05$), with the decrease in women more significant than the decrease in men. This might be due to the bonds between the hypnodontist and the patient, known as good rapport, while there was no significant decrease by using dental inhalation conscious sedation, with a p value of $p>0.05$. Dental inhalation conscious sedation relaxed the patient by suppressing the central nervous system using Nitrous Oxide (N_2O), thus reducing the dental anxiety. N_2O was combined with O_2 to give a sedative and joyous state without decreasing CRF secretion.¹⁷

This study showed that the QoL after significantly improved after dental hypnosis. It could be seen from the declined value of OHRQoL-23 index, indicating a better QoL, whereas in the dental sedation group, the control group, showed no significant improvement in the QoL. Dental anxiety might affect the QoL, due to treatment avoidance, thus worsening their oral condition and eventually affecting their QoL.¹⁸ This is in line with Miettinen (2012), which stated that chronic pain is associated with poor QoL.¹⁹

The Mann Whitney test showed that there was a significant difference in the decreasing levels of patient's salivary cortisol hormone between dental hypnosis intervention and dental inhalation conscious sedation intervention with a p value of 0.000 ($p<0.05$). Krueger et al (2005) stated that there was a significant decrease in the dental hypnosis intervention compared to the control group.^{15,20} This might be due to dental hypnosis long-term effects since it affects the subconscious mind, rather than the temporary effects of sedation therapies. Cortisol hormone is a long-term stress hormone, therefore dental hypnosis intervention might be better suited.

The Spearman Rank Correlation test showed a very strong positive correlation with a correlation coefficient of 0.08, meaning that the more dental hypnosis is carried out, the lower the OHRQoL-23 index value, indicating a better QoL. Dental anxiety greatly affected the oral health status and life of a patient, therefore the successful management of anxiety during dental treatment could encourage patients to maintain their oral health, thus enhancing their quality of life.²¹

Conclusions

In conclusion, dental hypnosis-hypnodontic communication has been proven to be effective on decreasing salivary cortisol hormone levels, an anxiety level biomarker, in patients experiencing dental anxiety who were going to get tooth extraction. There was also a very significant correlation between dental hypnosis intervention and the QoL, which could be seen from the decreased value in OHRQoL-23 index. There was also a significant decrease in salivary cortisol hormone levels, an indicator of decreased anxiety levels, in patients who were going to get tooth extraction and had dental anxiety, who received dental hypnosis-hypnodontic communication intervention.

Declaration of Interest

The authors report no conflict of interest.

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