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Frequency of oral behavioural habits with respect to oxidative stress-related gene polymorphisms

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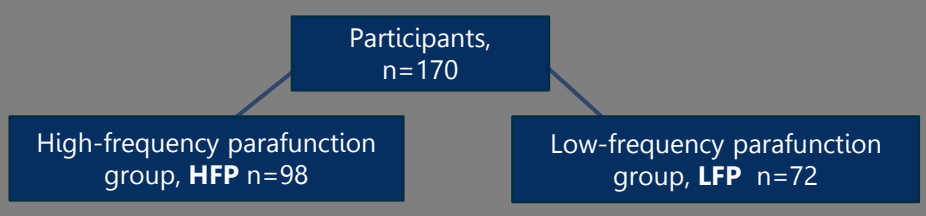
OBJECTIVES

Numerous studies have found a link between oral behavioural habits/parafunctions (such as bruxism) and psychological stress (1). Moreover, anxiety and psychological stress have been linked to oxidative stress, which is caused by an imbalance of free radicals and antioxidants (2). This relationship might be the result of genetics (3).

Aim of this study was to investigate distribution of polymorphisms in genes coding for proteins with antioxidative properties (glutathione peroxidase 1 (*GPX1*), superoxide dismutase 2 (*SOD2*), and catalase (*CAT*)) with respect to different frequencies of oral behaviours, and to explore whether polymorphisms in these genes can be associated with participants' psychological and psychosomatic characteristics.

MATERIALS AND METHODS



**Participants were devided according to Oral Behavioural Checklist (OBC) (score range=0-84), participants with ≥25 were located in HFP group)*

DNA from buccal mucosal swabs (*Figure 1*) was analyzed for SNPs in ***GPX1* (rs1050450), *SOD2* (rs4880)**, **and *CAT* (rs1001179)** using real-time TaqMan genotyping assays on an ABI 7300 Real-Time PCR Instrument System (Applied Biosystems, Waltham, MA, USA) (4). Participants completed questionnaires for **anxiety** (General Anxiety Disorder Questionnaire**, GAD-7**), **depression** (Patient Healthcare Questionnaire, **PHQ-9**), **hypervigilance** (Brief Hypervigilance Scale, **BHS**) and **somatosensory amplification** (Somatosensory Amplification Scale, **SSAS**).


Figure 1. *Buccal mucosa swab*

Analyses were performed according to:
i) **dominant model** (genotypes with at least 1 copy of minor allele vs. dominant homozygous)
ii) **recessive model** (recessive homozygous vs. other two genotypes)

Minor allele represented risk allele. → rs1050450 (*GPX1*): G/A minor allele: A
rs4880 (*SOD2*): A/G, minor allele: G
rs1001179 (*CAT*), C/T minor allele: T

RESULTS

Participants with high-frequency parafunction had significantly higher anxiety and depression scores and increased hypervigilance and somatosensory amplification when compared to participants with low-frequency parafunction (***Table 1***).

The frequency of participants carrying two copies of minor allele A (rs1050450 of *GPX)* was higher in those with high-frequency parafunction compared to those with low-frequency parafunction (***Table 2***).

Individuals with high-frequency parafunction and AA genotype of rs4880 reported significantly higher hypervigilance scores compared to AG+GG genotype carriers (6.4 vs 4.0, p=0.003) (***Figure 2***).

Participants with high-frequency parafunction caring CC genotype of rs1001179 reported the highest depression scores compared to other subgroups. However, only in the group with low-frequency parafunction significant differences between CC genotypes and other genotypes were seen (PHQ-9: 4.9 vs. 3.0, p = 0.021)(***Figure 3***).

CONCLUSION

Our results show that participant with high-frequency parafunction are more prone to psychological and psychosomatic problems. Furthermore, we have shown that certain genotypes in oxidative-stress-related genes may be associated with an individual's psychological profile and predisposition to harmful oral behaviors.

Table 1. *Characteristics of study's participants*

Variable			Oral Behaviours Frequency	
			LFP (*n* = 72)	HFP (*n* = 98)
Gender	Female, *n* (%)		53 (73.6%)	85 (86.7%)
	Male, *n* (%)		19 (26.4%)	13 (13.3%)
	p [b]		**0.031**	
Age	Female	Mean (SD)	29.51 (10.45)	27.06 (9.27)
		p [a]	0.083	
	Male	Mean (SD)	30.63 (10.96)	25.54 (6.79)
		p [a]	0.077	
Education level	Elementary school, *n* (%)		1 (1.4%)	5 (5.1%)
	High school, *n* (%)		15 (20.8%)	9 (9.2%)
	Student, *n* (%)		31 (43.1%)	50 (51%)
	College Degree, *n* (%)		18 (25%)	27 (27.6%)
	Master's Degree, *n* (%)		7 (9.7/%)	7 (7.1%)
	p [b]		0.804	
Somatosensory amplification (SSAS) (0–40)	Mean (SD)		12.19 (5.03)	15.79 (5.85)
	p [a]		**<0.001**	
Anxiety symptom severity (GAD-7) (0–21)	**Mean (SD)**		3.42 (2.77)	5.05 (4.22)
	p [a]		**0.020**	
Hypervigilance (BHS) (0–20)	Mean (SD)		3.47 (2.89)	4.59 (3.48)
	p [a]		**0.046**	
Depression symptom severity (PHQ-9) (0–27)	Mean (SD)		3.90 (3.30)	6.01 (4.68)
	p [a]		**0.001**	

[a] Mann–Whitney *U* test, [b] Chi-squared test
HFP, high-frequency parafunction group; LFP, low-frequency parafunction group; GAD-7, Generalized Anxiety Disorder-7; PHQ-9, Patient Health Questionnaire-9; SSAS, Somatosensory Amplification Scale; BHS, Brief Hypervigilance Scale; n, number of participants; p, p-value; SD, standard deviation.

Table 2. *Distribution of genotypes – recessive model*

		LFP (*n* = 72)		HFP (*n* = 98)	
rs1001179 *(CAT)*		TT	CT + CC	TT	CT + CC
n (%)		4 (5.6%)	68 (94.4%)	9 (9.2%)	89 (90.8%)
p		0.379			
rs4880 *(SOD2)*		GG	AG + AA	GG	AG + AA
n (%)		14 (19.4%)	58 (80.6%)	20 (20.4%)	78 (79.6%)
p		0.877			
rs1050450 *(GPX1)*		AA	GA + GG	AA	GA + GG
n (%)		3 (4.2%)	69 (95.8%)	14 (14.3%)	84 (85.7%)
p		**0.030**			

Chi-squared test and Fisher's exact test
HFP, high-frequency parafunction group; LFP, low-frequency parafunction group; n, number of participants; p, p-value; CAT, catalase; SOD2, super oxide dismutase 2; GPX1, glutathion peroxidase 2

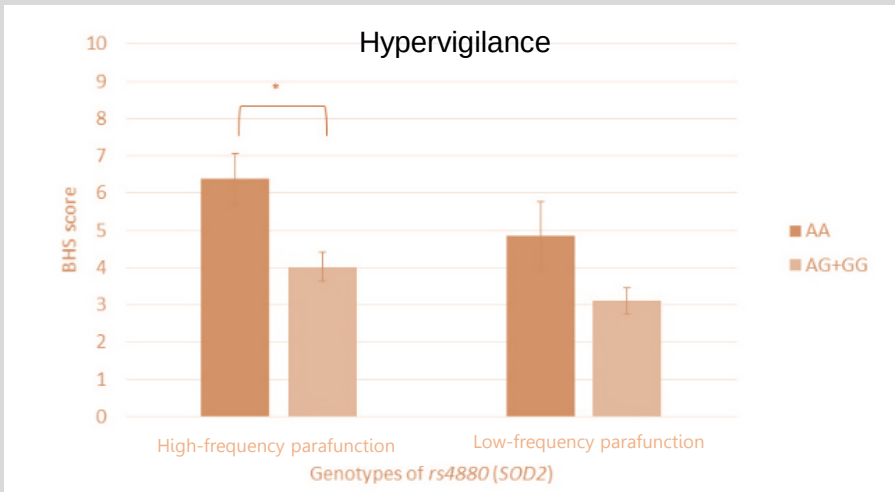


Figure 2. *Brief Hypervigilance Scale (BHS) scores of participants with different genotypes of rs4880 (SOD2), showing a comparison of participants with high- and low-frequency parafunction. Data are expressed as mean ±SME; * represents p < 0.05*

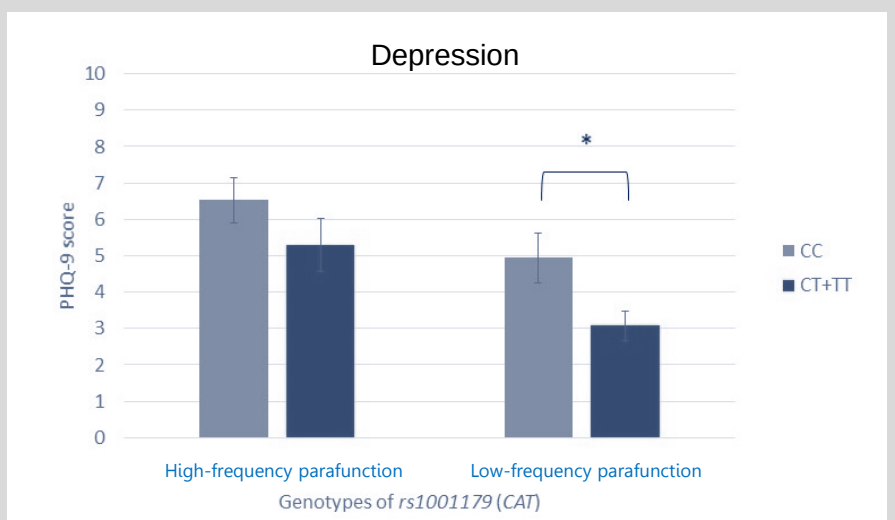


Figure 3. *Patient Health Questionnaire-9 (PHQ-9) scores of participants with different genotypes of rs1001179 (CAT), showing a comparison of participants with high- and low-frequency parafunction. Data are expressed as mean ± SME; * represents p < 0.05*

LITERATURE

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