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The relationship between emotional intelligence and initial response to a standardized periodontal treatment

A pilot study

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Abstract

Objectives: Emotional intelligence (EI) is a psychological construct, which has been proposed as a measure of coping mechanisms. The aim of this pilot study was to investigate the relationship between different domains of EI, and initial response to a simplified non-surgical treatment protocol in 29 patients with chronic periodontitis.

Methods: Assessment of patients included socio-demographic and behavioural variables and assessment of EI. Clinical assessment included measurement of plaque and gingival bleeding. Patients received oral hygiene instruction (OHI) and supragingival scaling and polishing over two visits, and re-assessed after 3 weeks.

Results: There was a significant overall reduction in plaque and bleeding. Plaque reduction was positively associated with the EI construct of intentionality, resilience, constructive discontent and personal power (Spearman's rank test). Reduction in bleeding was positively correlated with resilience, constructive discontent and intuition.

Conclusions: This pilot study demonstrated an association between EI domains and short-term changes in plaque and bleeding, and suggest that initial responses to standardized periodontal treatment may be partly related to EI.

Key words: coping mechanisms; emotional intelligence; periodontal treatment; periodontitis; plaque control

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The initial treatment of periodontal disease is dependent on the establishment of good oral hygiene practices by the patient, and in the long term, treatment success requires a suitable maintenance programme to sustain these practices. The achievement of the behavioural change required to establish adequate plaque control remains a constant challenge to the periodontist. An understanding of the barriers to successful oral hygiene instruction (OHI) and the factors which may help to overcome them is an important question in this field.

It is now acknowledged that psychosocial and psychological factors may influence the aetiology of periodontal diseases (Marcenes & Sheiham 1992, Monteiro da Silva et al. 1996, Croucher et al. 1997, Genco et al. 1998, Hugoson et al. 2002). Both factors can be divided into risk factors and protective factors. The World Health Organization has defined risk factors as '' social, economic or biological status, behaviours or environments which are associated with or cause increased susceptibility to a specific disease, ill health, or injury'' (Nutbeam 1986). For example, patients with higher levels of work stress (Marcenes & Sheiham 1992) and patients with more negative life events (Croucher et al. 1997) are significantly more likely to have periodontal disease. Conversely, protective factors are associated with maintenance of health. For example, patients with better marital quality (Marcenes & Sheiham 1996) and better coping mechanisms or higher level of social support (Monteiro da Silva et al. 1995, Genco et al. 1999, Wimmer et al. 2002) are less likely to have periodontal disease. Hence, it is interesting to note that individuals under more financial pressures had an increased risk of loss of attachment and alveolar bone (Genco et al. 1999). Interestingly, despite this, subjects with

increased financial pressures who exhibit high levels of problem-based coping (positive coping) had similar levels of periodontal disease than those under lower levels of financial pressures (Genco et al. 1999).

Despite the evidence regarding the relationship between the aetiology of periodontal disease and psychosocial and psychological factors, there are few studies that have tested the association between these factors and the outcome of periodontal treatment. Axtelius et al. (1998) have suggested that patients with a more rigid personality and a less stressful psychosocial situation in the past tend to respond better to periodontal treatment than patients with more psychosocial strain and passive-dependent traits. Becker et al. (1998) have suggested that patients with a more positive view of themselves were more likely to comply with continued maintenance therapy. Consequently it is suggested that the subject's responses to stressors may be a key determinant of the overall effect of stress (Becker et al. 1998).

Coping mechanism is generally considered to be a protective factor in disease risk, although the concept consists of a ''big umbrella'' of a number of factors (Kristenson et al. 2004). Emotional intelligence (EI) is a psychological construct, which is considered to be a measure of coping skills. EI was first described by Salavoy & Mayer (1990) and was based on the previous concept of social intelligence, which dates back to the 1920s. They have defined EI as ''the subset of social intelligence that involves the ability to monitor one's own and others'' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions''. Although, some other definitions of EI have been given by Bar-On et al. (2003), Cooper and Sawaf (1997) and Goleman (1995), all these definitions have similar concepts related to the ability of perceiving, assimilating and managing emotions (Mayer et al. 1999). The measurement of EI allows for separate scores on different domains within the EI areas and overall concept (Cooper & Sawaf 1997).

In previous studies, EI has been associated with mental health (Ciarrochi et al. 2002), smoking behaviour (Trinidad & Johnson 2002, Trinidad et al. 2004) and health-related quality of life (Extremera & Fernandez-Berrocal 2002). All these studies suggest that different domains within the EI concept can have individual effects on health, behaviour and subjective quality of life.

Therefore, the aim of this pilot study was to investigate the relationship between different domains of emotional intelligence and the response to a standardized initial treatment for chronic periodontitis. Specifically, we aimed to test the hypothesis that patients with higher levels of EI respond more positively to a standardized protocol for initial periodontal treatment than patients with lower levels of EI.

Material and Methods

This clinical pilot study was conducted at The Periodontal Consultant Clinic of The Dental Teaching Hospital, Royal London Hospital. Ethical approval was received from the East London and City Health Authority Local Ethics Committee. Author A. B. O. G. was responsible for all clinical aspects and data collection for the project.

Thirty-three patients with chronic periodontitis were invited to participate in the study. The inclusion criteria for patients were:

- age range between 20 and 60 years;
- minimum of 10 teeth in each arch;
- minimum of one tooth with plaque;
- minimum of one tooth with bleeding;
- minimum of two teeth with pocket depths >4 mm.

The exclusion criteria included those:

- who could not speak English;
- at risk of infective endocarditis;
- with systemic diseases that can adversely affect host defence systems;
- using long-term chlorhexidine mouthwash;
- taking medication that might contribute to gingival overgrowth.

Each patient that agreed to enrol in the study signed an informed consent sheet.

For initial assessment, participants were interviewed in a separate interview room where the patients were assured privacy. The interview consisted of a structured questionnaire to assess the patient's demographic characteristics, periodontal health-related behavioural factors, and their EI. Piloting of the questionnaire was previously conducted before the starting of the study in five subjects to test the understanding of the questions, to identify possible queries and to estimate the time taken to fully complete it. The socio-demographic and behavioural factors included age, gender, marital status, level of education, employment status, reported tobacco consumption, oral hygiene habits and dental attendance. Assessment of EI was carried out using a questionnaire as described by Cooper & Sawaf (1997).

EI is divided into three different areas: emotion awareness, competencies and values and beliefs, and each area is divided into different domains. The area of ''emotional awareness'' includes assessment of emotional self-awareness, emotional expression and emotional awareness of others as domains. The area of ''competencies'' include assessment of intentionality, creativity, resilience, inter-personal connections and constructive discontent as domains. The area of ''values and beliefs'' included outlook, compassion, intuition, trust radius, personal power and integrated self as domains.

The clinical examination was carried out in a standard dental operatory. Buccal and lingual surfaces were assessed for presence of plaque and bleeding after probing. The six Ramfjord teeth were examined and absent index teeth were substituted by the closest and most similar tooth.

Following the interview and clinical examination, participants received a standardized initial periodontal treatment. The treatment included two visits, 1 week apart. In the first visit, the patients received 10 min. of oral hygiene instruction which included toothbrushing (Bass 1954), flossing and tongue brushing instruction. Patients also received supra-gingival scaling and polishing in two quadrants of one side of the mouth. In the second visit, oral hygiene instruction was re-inforced for 5 min. and scaling and polishing in the remaining two quadrants was carried out. The selection of each side of the mouth to be treated first was systematically alternated according to patients' entry in the research.

Participants were followed for 3 weeks after completion of standardized periodontal treatment. Follow-up clinical examination included the measurement of plaque and bleeding levels using the same criteria used in the baseline examination. The changes between baseline and follow-up in the plaque index score were used to assess behaviour change,

which indicated compliance of the patient with the oral hygiene instruction given during the treatment. The changes between baseline and follow-up in the bleeding score were important to assess the biological responses in the patients' periodontal tissue.

Data analysis

A data entry system was set up and the raw data entered onto a PC and the Statistical Package for Social Sciences (SPSS) was used. Plaque and bleeding levels were obtained by counting the number of individual tooth surface with plaque and bleeding (range 0–12). Frequency distribution of the variables was calculated. Non-parametric tests were applied in order to test the association between EI domains and treatment outcome. The level of significance was set at 5% ($p < 0.05$). Wilcoxon's signed rank test was used to evaluate the difference in plaque and bleeding levels before and after treatment. Mann–Whitney test was used to test the association of gender, level of education, employment status, hours of work, marital status and smoking with changes in plaque and bleeding scores. Spearman's correlation test was used to test the relationship between EI domains and changes in the plaque and bleeding levels. In addition, Mann–Whitney test was used to test whether different EI domains were associated with different socio-demographic characteristics (gender, schooling, employment status, being a part-time or full-time employee and marital status).

Results

In total, 33 patients were invited to participate in this pilot study. The response rate was 96.5% (32 patients). Three patients did not attend all the visits, representing a drop out of 10.3%. In total, 29 patients (88%), 18 females (62%) and 11 males (38%) completed the study. The frequency distribution of demographic and behavioural variables is presented in Table 1.

The difference in the levels of plaque and bleeding between the baseline and the follow-up assessment was statistically significant demonstrating a significant reduction in both plaque ($p < 0.001$) and bleeding levels ($p < 0.001$). However, there was considerable variation in response between subjects (Table 2).

When changes in plaque and bleeding were correlated to EI domains, it was

Table 1. Frequency distribution of independent variables of the study sample

Independent variables	*N*	%
Level of education		
Low (secondary school completed or less)	16	55.2
High (YTS, BTEC,	13	44.8
A-level, university degree)		
Employed	21	72.4
Full-time job	18	62.1
Marital state		
Married	17	58.6
Single	5	17.2
Divorced or separated	7	24.1
Non-smokers	21	72.4
Never smoked	17	58.6
Brushing		
At least once a day	29	100
Hygiene devices		
Manual toothbrush	21	72.4
Electric toothbrush	13	44.8
Dental floss	15	51.7
Reported dental visits		
At least once every 6 months	22	75.9
	Mean (SD)	[range]
Age	44.5 (6.6)	[34,58]

Table 2. Individual patient data for number of surfaces scoring positive for presence of plaque and bleeding at baseline, follow-up and difference between baseline and follow-up

Patients	Plaque			Bleeding		
	baseline	follow-up	difference	baseline	Follow-up	difference
1	12.00	9.00	− 3.00	12.00	10.00	− 2.00
2	12.00	5.00	− 7.00	12.00	9.00	− 3.00
3	10.00	2.00	− 8.00	12.00	7.00	− 5.00
4	11.00	10.00	− 1.00	12.00	12.00	.00
5	11.00	5.00	− 6.00	12.00	7.00	− 5.00
6	7.00	4.00	− 3.00	9.00	5.00	− 4.00
7	10.00	7.00	− 3.00	12.00	9.00	− 3.00
8	12.00	6.00	− 6.00	12.00	9.00	− 3.00
9	8.00	5.00	− 3.00	11.00	10.00	− 1.00
10	11.00	9.00	− 2.00	12.00	12.00	0.00
11	7.00	5.00	− 2.00	10.00	8.00	− 2.00
12	10.00	7.00	− 3.00	12.00	11.00	− 1.00
13	6.00	7.00	1.00	11.00	6.00	− 5.00
14	7.00	9.00	2.00	11.00	12.00	1.00
15	9.00	1.00	− 8.00	10.00	6.00	− 4.00
16	12.00	1.00	− 11.00	12.00	6.00	− 6.00
17	12.00	12.00	0.00	12.00	11.00	− 1.00
18	12.00	7.00	− 5.00	12.00	10.00	− 2.00
19	9.00	6.00	− 3.00	11.00	8.00	− 3.00
20	11.00	9.00	− 2.00	11.00	11.00	0.00
21	12.00	5.00	− 7.00	11.00	8.00	− 3.00
22	12.00	11.00	− 1.00	12.00	11.00	− 1.00
23	11.00	7.00	− 4.00	12.00	12.00	0.00
24	12.00	12.00	0.00	12.00	12.00	0.00
25	12.00	12.00	0.00	12.00	12.00	0.00
26	10.00	11.00	1.00	12.00	11.00	− 1.00
27	11.00	11.00	0.00	12.00	11.00	− 1.00
28	12.00	9.00	− 3.00	12.00	10.00	− 2.00
29	7.00	1.00	− 6.00	9.00	4.00	− 5.00
Median	11	7	− 3	12	10	− 2
[Range]	[6, 12]	[1, 12]	[− 11, 2]	[9, 12]	[4, 12]	[− 6, 1]
p value		> 0.001*			> 0.001*	

*Wilcoxon'signed test.

noticed that patients presenting a higher score in specific EI domains responded better to treatment. Changes in plaque were positively correlated to intentionality ($r = 0.408$, $p = 0.028$), resilience ($r = 0.498$, $p = 0.006$), constructive discontent ($r = 0.444$, $p = 0.016$) and personal power ($r = 0.374$, $p = 0.045$). Changes in bleeding were positively correlated to intentionality ($r = 0.358$, $p = 0.057$), resilience ($r = 0.519$, $p = 0.004$), constructive discontent ($r = 0.542$, $p = 0.002$), and intuition ($r = 0.433$, $p = 0.019$). Changes in plaque or bleeding were not significantly correlated with other EI domains (Table 3).

In order to test for the presence of confounding variables, the association between changes in plaque and changes in bleeding and different socio-demographic characteristics (gender, schooling, employment status, being a part-time or full-time employee and marital status) was tested (Table 4). A positive statistically significant association was found between gender and bleeding reduction between visits ($p = 0.034$). There was no significant association between smoking and changes in plaque or bleeding. In addition, there was no significant association between different domains of EI and level of education and smoking.

The association between EI and different socio-demographic characteristics was also tested. Constructive discontent and outlook were equally statistically significantly associated with sex ($p = 0.04$) and creativity was statistically significantly associated with being employed or not (0.021).

Table 3. Correlation between changes in plaque and bleeding and the emotional awareness, competencies and values & believes' domains

	Change in plaque		Change in bleeding	
	correlation coefficient	*p* value	correlation coefficient	*p* value
Emotion awareness				
Emotion self awareness	− 0.005	0.978	− 0.012	0.949
Emotional expression	0.195	0.311	0.088	0.649
Emotional awareness of others	− 0.006	0.974	0.127	0.510
Competencies				
Intentionality	0.408	0.028*	0.358	0.057
Creativity	0.050	0.799	0.198	0.302
Resilience	0.498	0.006*	0.519	0.004*
Inter-personal connections	− 0.105	0.588	− 0.160	0.408
Constructive discontent	0.444	0.016*	0.542	0.002*
Values and believes				
Outlook	0.154	0.425	0.301	0.112
Compassion	0.014	0.943	0.231	0.228
Intuition	0.309	0.103	0.433	0.019*
Trust radius	0.059	0.759	− 0.040	0.835
Personal power	0.374	0.045*	0.353	0.060
Integrated self	0.030	0.879	0.117	0.546

Spearman's non-parametric test.
*Significant correlation $p < 0.05$ level (two-tailed).

Table 4. Association between change in plaque and change in bleeding and socio-demographic characteristics of treated patients

	Change in plaque			Change in bleeding		
	mean rank	sum of ranks	*p* value	mean rank	sum of ranks	*p* value
Sex						
Female	16.25	292.50		17.58	316.50	
Male	12.95	142.50	0.307	10.77	118.50	0.034*
Level of education						
Lower level	14.28	228.50		16.09	257.50	
Higher level	15.88	206.50	0.611	13.65	177.50	0.436
Employment status						
Employed	13.79	289.50	0.209	13.71	288.00	0.182
Non-employed	18.19	145.50		18.38	147.00	
Hours of work						
Full-time job	10.81	194.50		10.58	190.50	
Part-time job	12.17	36.50	0.719	13.50	40.50	0.445
Marital status						
Married	14.46	173.50		16.92	203.00	
Other	15.38	261.50	0.771	13.65	232.00	0.302
Smoking						
Smoker	16.94	135.50		16.75	134.00	
Non-smoker	14.26	299.50	0.445	14.33	301.00	0.489

Mann–Whitney test.
*Association is significant when $p < 0.05$.

Discussion

The findings of this pilot study ($n = 29$) should be interpreted with caution. The size of the sample was small and did not allow for multivariate modelling. Furthermore, with the level of significance set at 5% and 28 correlations performed, there is a probability of obtaining statistically significant results by chance. It is unlikely that covariance has affected the findings of this pilot study. The only potential confounding factor in the model was sex of participants. Sex was related to constructive discontent and changes in bleeding. A variable is considered a confounding factor if it is associated with both the independent and dependent variables. None of the socio-economic and behavioural factors such as tobacco smoking were related to both EI domains and outcome measures. Thus, the data provide good evidence that EI may affect response to initial periodontal therapy.

The outcome measures used in this study were sound and sufficient to assess the short-term response to the standardized periodontal treatment adopted. Presence of plaque is a good measure of oral hygiene behaviour and provides evidence for the ability of participants to comply with OHI provided during the research intervention. Presence of bleeding is useful in assessing the biological changes in response to the standardized periodontal treatment. According to Pihlstrom (2001), subsequent measures of the bleeding are able to assess reduction of periodontal inflammation and therefore effectiveness of treatment.

It is logical that a reduction in plaque would lead to changes in bleeding.

Relevant domains of EI seem to be related to both plaque and bleeding changes (Table 3), which provides further evidence to the findings. Resilience and constructive discontent were related to changes in plaque and bleeding ($p < 0.05$). Personal power and intentionality were statistically significantly related to changes in plaque and they were of marginal statistical significance in relation to changes in bleeding ($p = 0.06$). Intuition was related to changes in bleeding but not to changes in plaque ($p = 0.1$). The lack of statistical significance observed may be a type II error because of the small size of sample.

The 3 weeks follow-up period adopted in this study was sufficient to demonstrate short-term changes in plaque and bleeding following a simple two-visit initial treatment protocol. However, clearly the short-term follow-up period used in this study is not sufficient to conclude that EI is related to long-term or permanent changes in plaque and bleeding levels.

The emotional competencies area of the EI assessment assesses skills and behaviour patterns that one has developed over time in response to the people, events and circumstances of their lives. The emotional values and beliefs area represents how individuals'' process their thinking and emotions and how they use them to guide their actions. Values are considered the deepest emotional concepts that influence the consistency of the relationship between expression of feelings and actual action. One's beliefs are considered personal principles that guide their actions.

As expected, tobacco smoking was not significantly related to the changes in plaque and in bleeding between the baseline and the follow-up period. The majority of participants were non-smokers (72%), smoking counselling was not part of the standardized periodontal treatment given to the patients in this study, and there were no changes in smoking status during the follow-up period. Therefore, this finding does not challenge or discredit the fact that tobacco smoking is a well established risk factor for the aetiology of the destructive periodontal disease (Preber et al. 1980, Bergstrom & Eliasson 1987, Haber & Kent 1992, Grossi et al. 1994, 1995). Also, there is clear evidence that tobacco smoking is related to adverse response to periodontal treatment (Johnson & Hill 2004).

The association between EI and short-term response to initial periodontal therapy is biologically plausible. The mechanisms by which EI influenced initial treatment outcome were not addressed in this study. However, there is clear evidence from previous studies that psychosocial factors may influence periodontal disease susceptibility not only by influencing behavioural factors such as plaque control and smoking, but also may act directly to modulate the host response independently of any effects on behaviour (Croucher et al. 1997). The present study demonstrated the effects of significant EI domains on behavioural change. Further research should assess changes in biological markers of host response such as immune response.

The findings of this pilot study are relevant because it raises the possibility of developing an intervention aimed at improving patient's EI, which in turn may improve response to initial treatment of periodontal diseases. According to Mayer et al. (1999), EI can be taught and improved, and it can be developed with age and experience. Further studies are required to confirm the findings of this pilot study. They should include a larger sample size, prolonged follow-up and inclusion of outcome measures of response to periodontal treatment such as clinical attachment loss. In addition, further research should test the effect of EI domains on the uptake of a positive behaviour such as smoking cessation following the introduction of smoking counselling in periodontal therapy. This should include testing alternatives psychological models of behavioural changes in relation to adherence to treatment. Finally, further research should also test the effect of EI in the response to more advanced therapies.

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Clinical Relevance

Psychological and psychosocial factors may influence susceptibility to periodontitis, by affecting both behaviour and by direct effects on the host response. In this pilot study we tested if the short-term response to non-surgical periodontal treatment may be affected by EI, a psychological construct which measures the ability to cope with stress. We demonstrate an association between EI and short-term reduction in plaque and bleeding following treatment. If these results can be corroborated in larger and longer term studies it suggests that treatment outcome may be improved by psychological interventions aimed at improving a subject's EI.