IN BRIEF

- Dental fear is a complex issue associated with both early experiences in the dental office, as well as with subjects' personal characteristics.
- Subjects' dental anxiety is closely associated with the way they evaluate their dentist's behaviour.
- Dentists' evaluation is closely associated with subjects' individual pattern of attachment (avoidant or ambivalent).
- When dental anxiety develops, the subject's individual attachment pattern (secure, ambivalent or avoidant) may have the final effect of whether anxiety persists throughout life or can be modulated with time.

Modulation of dental anxiety – the role of past experiences, psychopathologic traits and individual attachment patterns

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Objective To evaluate factors affecting modulation of dental anxiety among adults.

Methods A total of 183 adult members of a closed communal society (Kibbutz), who have been treated since childhood only by the dentists employed in their community, were investigated concerning their past and present dental anxiety, evaluation of their past and present dentists, psychopathologic symptoms and individual pattern of attachment.

Results The best predictor of subjects' evaluation of their present dental anxiety was the scale of anxiety as recorded by the SCL-90R questionnaire. The best predictors of the decrease in subjects' dental anxiety over time were the evaluation of their past and present dentists and the secure and avoidant patterns of attachment. Patterns of attachment (avoidant and ambivalent) were the best predictors of subjects' evaluation of their present dentist.

Conclusions While psychopathologic traits are involved in subjects' present dental anxiety, pattern of attachment may have a dominant affect as to whether anxiety persists throughout life or can be modulated through a corrective emotional experience.

INTRODUCTION

The dental situation involves a high prevalence of stress, fear and anxiety. The estimate is that 6–15% of the world's adult population suffers from avoidance of dental care due to high dental anxiety and phobia.¹ The consequences of dental anxiety are often catastrophic resulting in severe deterioration of the patient's oral health² and posing a serious epidemiologic challenge to the dental professionals.

Reasons for the development of dental anxiety are still undefined. However, three main aspects have been suggested: (i) direct

conditioning, which originates in early, aversive encounters in the dental office,^{2–7} (ii) vicarious learning, through role models, such as family, peers and society,^{4,5} and (iii) psychodynamic and personality aspects, ie specific traits that when present, increase the patient's proneness for apprehension in the dental setting.^{3,8–10}

Since dental anxiety is complex with a multifactorial etiology, studies that examine the reasons for the development of dental anxiety face numerous problems. Subjects from varied socio-economic and cultural backgrounds are exposed to different dental experiences during childhood and early adolescence. Thus it is almost impossible to define the main cause in the development of the syndrome.

In Israel a unique communal society exists, the Kibbutz, which is a closed society where until recently all members of the same age were raised and educated together. This creates a homogenous group as far as cultural and socioeconomic aspects are concerned. All Kibbutz members (children and adults) presumably received uniform medical and dental treatment, with almost no alternative or choice. Therefore adults who have lived in the Kibbutz since early childhood have been exposed over time, to similar direct and indirect learning experiences regarding dental treatment. The level of dental anxiety of Kibbutz members is affected by both environmental factors (evaluation of their present dentist, memories of dental anxiety from childhood) and by several psychopathologic traits.¹¹

Attachment theory, initially presented by Bowlby,¹² concerns the bond between the child and their caregiver. Parental responsiveness and availability to the infant in time of distress provide the child with a 'secure base' upon which to organise experience and to handle stress. Ainsworth *et al.*¹³ identified three attachment styles: secure, ambivalent and avoidant. Secure children are more confident in the availability of their mother (or caregiver) and more likely to use them as a secure basis than children who are insecurely attached (ambivalent or avoidant).

The early experiences that shape the individual attachment pattern (labelled as 'internal working models') become an inner representation, which organises cognition, affects and behaviour throughout life.¹³ In the last several decades, Bowlby's attachment theory has become an important framework for understanding psychological development in adulthood. The attachment-working models have been examined in adulthood and were found to affect the strategies people use to deal with distress and to regulate

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affect in any distressing or challenging situation.¹⁴ Furthermore, attachment insecurity leads to higher susceptibility to stress, increased use of external regulators of affect, and altered help-seeking behaviour.¹⁵ Thus, it could possibly influence the subject's ability to regulate affect in an emotionally stressing situation, such as dental treatment.

In the present study, a further attempt was made to evaluate the factors that affect the modulation of dental anxiety among Israeli adult members of Kibbutzim in Israel, who have been treated since childhood only by the dentist(s) employed in their community. Secure individuals are more likely to rely on new information in making social judgments than subjects with avoidant and/or ambivalent attachment patterns.¹⁶ Therefore it is also possible that they are more likely to modulate their attitude toward their treating dentist (and dental treatment) when exposed to a more humane and empathic attitude than subjects with insecure attachment.

MATERIALS AND METHODS

Study population

A preliminary screening of Kibbutzim in Israel was initially performed. Many Kibbutzim employed poorly qualified dentists in the past. These dentists worked in a harsh and painful manner because of various economic and social factors. However, this trend has completely changed within the last 20 years. The initial screening included information about previous dentist(s) employed in each Kibbutz and their method of treatment and about the patient population. To participate in the study, a Kibbutz had to include at least 30 members over the age of 20 who had been living there since early childhood and had been treated until the age of 18 only by the Kibbutz dentist(s). Four Kibbutzim, established between the years 1926 to 1949, were included in the study (one Kibbutz was excluded due to an exceptionally low response rate). The relevant population in the four Kibbutzim was 373 with an average response ratio of 49% (final number of participants = 183, 58% female, mean age 35.8±10.6). Details regarding the demographic characteristics of the participating Kibbutzim are presented in Table 1. When the groups of relevant population and responders were compared in each Kibbutz, no significant differences were found regarding mean age. The respondents' group, however, showed a higher percentage of females. This corresponds to the general trend in which women show higher response rates in various studies regarding dental anxiety.¹ In all Kibbutzim, dental treatment until the 1980s was carried out without local anaesthetic on a routine basis. At present, a local anaesthetic is used for all types of treatment.

Questionnaires

1. *Dental Anxiety Scale (DAS)*. The present study used the questionnaire developed by Corah.¹⁷ The DAS is one of the major and most widely used self-report questionnaires of dental anxiety. DAS provides a range of scores from a minimum of 4 (no anxiety) to 20 (extreme anxiety) and has shown a high predictive validity rate.¹⁸ Scores of 13 or higher indicate highly fearful or phobic individuals.¹⁸ Since its development, DAS has been used exten-

sively in research projects performed on anxious dental patients.^{1,19,20} In the present study, the Hebrew version of DAS was used, for which validity has been well established.^{11,21-25} Subjects were presented with both a present and past tense version of the questionnaire as previously reported.¹¹ The present version related to the level of dental anxiety at present (DASn) and the past version related to the level of dental anxiety as remembered from childhood (DASp).

2. *Dentist Evaluation Scale (DES)*. The questionnaire was initially developed and validated in Hebrew to assess the assumed performance of an 'ideal' dentist (eg, professionalism, patience, inflicting pain, etc).²⁶ The final questionnaire includes four questions representing four traits relating to the dentist's skills (to what extent the dentist works in a confident and careful manner; does not inflict pain; is patient and polite; and creates a pleasant and relaxing atmosphere). DES provides a range of scores from a minimum of 4 (extremely low evaluation) to 20 (very high evaluation). The DES was presented to subjects in a present and past tense version, as described previously.¹¹ with the present version relating to the present dentist (DESn) and the past version relating to the dentist who treated subjects at childhood (DESp).

3. *Psychopathologic evaluation*. The SCL-90R questionnaire developed by Derogatis²⁷ was used for psychopathologic evaluation. The questionnaire serves as a general measure of psychopathology in clinical and research situations and has shown high validity and reliability in clinical studies.²⁸ It has been used successfully in various clinical dental settings.^{24,29-31} The questionnaire relates to nine psychopathologic symptoms: somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, anger-hostility, phobic anxiety, paranoid ideation, and psychoticism. Three general psychopathologic scales are defined: Positive Symptom Distress Index (PSDI), Positive Symptom Total (PST) and Global Symptom Index (GSI).

4. *Attachment Styles questionnaire (AS)*. This questionnaire, developed by Mikulincer *et al.*³² is based on the descriptions of Hazan and Shaver¹⁴ of feelings and cognitions regarding attachment, each corresponding to an attachment style, and was used to define the personal attachment style of each respondent (secure, ambivalent or avoidant). The AS questionnaire consists of 15 statements (5 statements per attachment style), eg 'I find it relatively easy to get close to others' (secure attachment), 'I am somewhat uncomfortable being close to others' (avoidant attachment), and 'I find that others are reluctant to get as close as I would like' (ambivalent attachment style). Subjects were asked to state, on a 7-point bipolar scale ranging from 'not at all' (1) to 'very much' (7), the extent to which each statement applied to them. This 15-item scale was found to be highly reliable and valid in studies of Israeli samples.³²⁻³⁴ Similar to Birnbaum *et al.*³⁴ items corresponding to each style were averaged, the values of these scores were compared and each participant was assigned to the style that had

Table 1 Demographic characteristics of the Kibbutzim				
Name of Kibbutz*	BG	GO	G	ED
Year of establishment	1949	1941	1926	1948
Relevant population (No):	36	60	168	109
% female	47	52	51	54
Mean age	27.75±4.05	37.91±10.04	43.4±12.1	37.04±10.16
Responders (No):	26	26	84	47
% female	53	61	55	62
Mean age	26.6±4.3	34.9±10.2	42.3±13.6	36.8±11.1
* Only initials of the Kibbutzim names are supplied due to privacy reasons

Fig. 1 Psychopathologic profile of the study population.

SCL-90-R traits as follows:

Som – Somatization
 Obs-com – Obsessive-compulsive
 Int-sens – Interpersonal sensitivity
 Dep – Depression
 Anx – Anxiety
 Hos – Hostility
 Phob – Phobic anxiety
 Par id – Paranoid ideation
 Psy – Psychoticism

the maximal value of the three alternatives. Of the subjects, 68.5% classified themselves as secure in relation to attachment (mean 4.67 ± 0.93), 24.2% as avoidant (mean 4.55 ± 0.73), and 7.3% as ambivalent (mean 5.13 ± 0.91). ANOVA analyses showed that the secure group had a higher security score than the two insecure groups ($F_{(2,175)}=38.87$, $p<0.000$); the avoidant group had a higher avoidance score than the two other groups ($F_{(2,175)}=53.44$, $p<0.000$); and the ambivalent group had a higher ambivalent score than the remaining attachment groups ($F_{(2,174)}=54.93$, $p<0.000$).

Procedure

The relevant authorities in each Kibbutz (secretary, health services coordinator, hygienist, etc) were approached and a detailed explanation concerning the study was provided. The initial demographic data concerning the Kibbutz population were acquired. Complete anonymity was a prerequisite for carrying out the study due to the close communal nature of the Kibbutz. All members of the relevant group in each Kibbutz were then approached through the Kibbutz mailing system and requested to participate in the study. Each member received an unmarked envelope, including an explanation about the study, an informed consent form and the questionnaires as specified above. As the study refers to both past and present reports of dental anxiety and dentist evaluation, and to reduce response bias to a minimum, questionnaires were presented in the following order: DASp, DESp, SCL-90R, AS, DASn, DESn, with each beginning on a separate page. Subjects were requested to return the questionnaires, anonymously, to a special mailbox within the Kibbutz. A general reminder card was posted to the entire population several weeks later. Envelopes remained unopened for several more weeks, when it was assumed that no more questionnaires would be returned. Any suggestion for an additional questionnaire mailing (to the entire population) or to reach some of the potential non-respondents by telephone or personal interview was strongly rejected by the Kibbutzim authorities. The rationale was that this would lead to antagonism and anger toward the relevant Kibbutz authority.

The Committee for the Approval of Human Subject Studies, Ministry of Health, State of Israel, Jerusalem, approved the study.

RESULTS

Mean values of subjects' dental anxiety and dentist evaluation are presented in Table 2. The general psychopathologic profile of the study population is presented in Figure 1.

Dental anxiety at present (DASn) correlated significantly with subjects' dental anxiety as recalled from the past, with the evaluation of their past dentist and with the traits of anxiety and hostility as recorded by the SCL-90R questionnaire (Pearson correlation coefficients: $r = 0.60$, -0.29 , 0.17 and 0.15 respectively, $p<0.05$). Subjects' evaluation of their present dentist (DESn) correlated with the avoidant pattern of attachment ($r=-0.18$, $p<0.05$).

The best predictor of dental anxiety at present (DASn) was dental anxiety as remembered from the past (stepwise regression, DASp; $r^2 = 0.37$; $\beta = 0.63$; $p<0.000$) followed by the evaluation of their present dentist, which added another 3% (DESn; $\beta = -0.17$; $p<0.01$). That is, higher dental anxiety in the past and lower evaluation of the present dentist led to higher dental anxiety at present. When variables based on memory (DASp, DESp) were excluded from the calculation, the best predictor of dental anxiety at present was the trait of anxiety as recorded by the SCL-90R questionnaire ($r^2 = 0.024$; $\beta = 0.15$; $p<0.05$).

The best predictor of the evaluation of the present dentist (DESn) was the avoidant pattern of attachment (Stepwise regression, $r^2 = 0.035$; $\beta = -0.31$; $p<0.01$) followed by the ambivalent pattern of attachment (another 4.3%, $\beta = 0.24$; $p<0.01$). Results remained similar when the variables based on memory (DASp, DESp) were excluded from the regression calculations.

To better understand the factors associated with the change that occurs in dental anxiety over time, a new variable was calculated which represents the difference between the level of subjects' dental anxiety at present and dental anxiety as remembered from childhood ($\Delta DAS = DASp - DASn$). Relationships between past and present variables and change in dental anxiety over time (ΔDAS) are presented in Figure 2.

The best predictor of the decrease in subjects' dental anxiety over time (ΔDAS ; Since ΔDAS is based on DASp and DASn, these variables were excluded from the calculation) were the evalua-

Table 2 Dental anxiety and dentist evaluation in past and present

	Past*	Present	p**
Dental anxiety	11.64 ± 3.31	9.58 ± 4.02	0.000
Dentist evaluation	11.71 ± 4.76	16.69 ± 2.94	0.000

*Dental anxiety - the higher the score the higher the anxiety; dentist evaluation - the higher the score the better the evaluation.

** independent sampled t-test

Table 3 Prediction of the decrease in subjects' dental anxiety over time (ΔDAS) (Stepwise regression analysis)

Model	Beta	t	Significance
DESp*	-0.31	-4.33	0.000
DESn	0.27	3.73	0.000
Secure	0.21	2.88	0.005
Avoid	0.16	2.56	0.025

*Variables as defined in the text: DESp - evaluation of the past dentist, DESn - evaluation of the present dentist; secure - secure pattern of attachment; avoid - avoidant pattern of attachment

Fig. 2 Relationship between past and present variables and change in dental anxiety over time (Δ DAS). Numbers represent Pearson correlation coefficients. Only correlations significant at the 0.05 level and higher are included.

Avoid – Avoidant pattern of attachment

Secure – Secure pattern of attachment

Som – Somatization according to SCL-90R

Anx – Anxiety according to SCL-90R

Hos – Hostility according to SCL-90R

PI – Paranoid ideation according to SCL-90R

Dep – Depression according to SCL-90R

GSI – General symptom index according to SCL-90R

tion of the past dentist (stepwise regression, DESp; $r^2 = 0.11$; $\beta = -0.31$; $p < 0.000$), the evaluation of the present dentist (DESn, an additional 6%), secure pattern of attachment (secure, an additional 3%) and avoidant pattern of attachment (avoid, an additional 3%) (Table 3).

DISCUSSION

The aim of the present study was to determine the factors that affect the modulation of dental anxiety over time. The study was conducted in a homogeneous society, where all subjects were exposed to similar direct and indirect learning experiences concerning dental treatment.

The response rate in the present study was about 49%, which was slightly below the average rate when compared with other mail surveys regarding general populations of dental patients.³⁵ In a review of 77 publications in four leading dental journals (*The British Dental Journal*, *The Journal of Prosthetic Dentistry*, *The Journal of the American Dental Association* and *Dental Update*),³⁶ the response rates to questionnaires varied from 17% to 100%, with an average response rate of 58%, in studies involving patients. The authors indicate that improvement in the response rate could be obtained by supplying a pre-paid return envelope and by following up initial distribution of the questionnaire, either with a reminder card or telephone call to non-responders. The Kibbutz, being a closed society, is very sensitive about personal privacy. Therefore, in the present study only the first two measures were applied, but due to the unique nature of the involved population, complete anonymity had to be assured, which prevented a more personal attempt to reach possible non-responders. As in any study, the response rate could have a crucial affect on the final results. One possibility is that the respondents are those who show more interest in the relevant subject³⁶ (ie those suffering from, or more interested in issues relating to high dental anxiety, personal attachment characteristics, etc as in the present study). One Kibbutz in particular showed an exceptionally low response rate (22%) and was excluded from the study. As the social structure in the Kibbutzim is extremely sensitive to personal nuances, it could be that the relevant authority in this Kibbutz (the dental assistant who was running the dental clinic) was personally disliked and rejected by the Kibbutz members, a fact which affected their willingness to cooperate with the study.

Despite the difficulties, mailed questionnaires have produced useful information in the past³⁶ with several studies showing that low response rates to health studies do not necessarily result in a high non-response bias.^{37,38} It is deeply believed that this was also the case in the present study.

Subjects participating in the present study reported significantly higher levels of dental anxiety in the past and a lower evaluation of their previous dentists compared with the present, similar to previous findings concerning Kibbutzim members in Israel.¹¹ This is probably because in the past, dentists who worked in the relevant Kibbutzim did not use local analgesia on a routine basis and apparently inflicted pain to their patients. Generally, the highly fearful or phobic patient scores 13 or higher on the DAS scale.³⁹ The harsh and painful past dental treatment led to the development of a society suffering from a relatively high level of dental anxiety. Nevertheless, the change to more 'humane' dentists and the routine use of local analgesia resulted in a significant decline in the levels of dental anxiety.

Among patients suffering from extreme dental anxiety and phobia, individual psychopathologic traits have been shown to coincide with patients' dental anxiety⁴⁰ and with their ability to reduce this anxiety as a result of behaviour therapy.²⁴ Present data confirm previous findings that dental anxiety is significantly associated with memories that subjects have regarding their dental experiences at childhood, as well as with several psychopathologic traits.¹¹ Nevertheless, it should be remembered that the patient's present anxiety can affect the description of previous experiences⁴¹ and that data concerning the past may be inadequate at times because of faulty memory and of a retrospective bias.⁴² When the variables based on memory (DASp, DESp) were excluded from the calculations, the variable which best predicted present dental anxiety was the trait of anxiety as recorded by the SCL-90R questionnaire. This confirms the notion that the level of subjects' dental anxiety is affected by both the dental experiences from childhood, as well as by psychopathologic traits.

High levels of dental fear are often attributed to aversive conditioning experiences, usually occurring during childhood, with a smaller percentage attributed to vicarious learning.^{2,3,6,43-46} However, the pattern of conditioning varies between individuals: anxiety may not be acquired in some as a result of a painful dental experience, while others acquire a phobia.⁷ The present findings further show that even under relatively homogenous conditions,

the subject's conditioning and modulating processes are affected by individual factors, such as specific psychopathologic traits and an attachment pattern.

While psychopathologic traits (as recorded by SCL-90R) are affected by situational factors and may change under different life conditions,²⁸ the three attachment styles (secure, ambivalent, avoidant) are presumably stable and trait-like over time and characterise adults.^{12,47-51} Although there was some dilemma of whether attachment insecurity should be understood as an emotional state or a personality trait, it is generally accepted that an attachment type is the result of an internal working model that guides the affects and behaviour when a threat is perceived. Furthermore, attachment type is understood as a disposition toward certain perceptions of others, certain perceptions of self, and certain preferred strategies that will be triggered by the presence of a perceived threat. Thus, the internal working model that provides consistency to the pattern of behaviour that emerges at the presence of a perceived threat is a trait.¹⁵

In the present study the strongest predictor of the decrease in dental anxiety over time (Δ ADAS) was the subjects' evaluation of their past and present dentists, followed by the secure and avoidant patterns of attachment. Concomitantly, avoidant and ambivalent attachment patterns were the best predicting factors of subjects' evaluation of their present dentist. This suggests that individual attachment styles may also affect the schemes that affect the dentist-patient relationship in adult life. For example, secure attachment will be organised by schemes that allow acknowledgment of distress and turning for support, avoidant attachment by schemes that restrict acknowledgment of distress and the associated attempts to seek comfort and support, and ambivalent attachment by schemes that direct attention toward distress in a hypervigilant manner that inhibits the development of autonomy and self-confidence.⁵²

Attachment insecurity could lead to increased disease risk.¹⁵ Attachment contributed to individual differences in stress physiological response, and insecure attachment led to symptom reporting and more frequent health risk behaviours, such as treatment non-adherence. Similarly, in the present study, the subjects' ability to deal with the stress associated with dental treatment was directly associated with both past and present experiences, as well as with their attachment pattern. Secure individuals are usually described as adaptable, capable, trusting and understanding.⁵³ Therefore, it is plausible that a secure pattern of attachment enables a person to modulate their level of anxiety when exposed to a corrective emotional experience with a dentist, while an avoidant or ambivalent pattern of attachment does not allow for such modulation.

The relationship between past and present factors and the change that occurred in the subjects' level of dental anxiety over time (Δ ADAS) as presented in Figure 2 shows that the subjects' ability to undergo an emotional change (a decrease in level of anxiety) is directly associated with both past and present experiences, as well as with the attachment pattern. Apparently, a secure attachment pattern enables one to modulate their level of anxiety when exposed to a corrective emotional experience.

As secure individuals are more likely to rely on new information in making social judgments than subjects with avoidant and/or ambivalent attachment patterns,¹⁶ they may be more likely to modulate their attitude toward their treating dentist (and dental treatment) when exposed to a more humane and empathic attitude (or to a behaviour modification treatment plan) than avoidant or ambivalent subjects.

Furthermore, attachment style is an important factor in assessing symptom perception and healthcare use,⁵⁴ a fact that can influence a subject's use of special care frameworks, such as clinics specialising in the treatment of dental anxiety, fear and phobia.

Undoubtedly, an intriguing issue in the treatment of dentally anxious patients is defining the factors that enable the patient to undergo emotional and behavioral changes and reduce high, maladaptive levels of anxiety to normal, accepted levels of stress, which allow routine dental treatment. The present data suggest that when a young person is exposed to traumatic and painful dental treatment which leads to high levels of dental fear, a secure attachment pattern is significant in the individual's ability to modulate this fear when later exposed to a corrective emotional experience. While learning processes and psychopathologic traits play a role in the development of dental anxiety, the attachment pattern may have the final affect of whether this anxiety persists throughout life or can be modulated with time. Further studies concerning the affect of attachment patterns on the development and modulation of dental anxiety will enable a better understanding of this complex issue.

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