ORIGINAL ARTICLE

WILEY International Journal of Dental Hygiene — Official Journal of the International Federation of Dental Hygienists

Attending and avoiding dental appointments: Do "bright" and "dark" motivational paths have a role?

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Abstract

Objective: The aim of this study was to test a self-determination theory (SDT) process model of the "bright" and the "dark" motivational pathways through dental attendance or avoidance to oral health.

Methods: A cross-sectional study was conducted among 322 students from all study disciplines at the University of Oslo. Participants responded to a survey with validated questionnaires. Structural equation modelling was used to test the SDT model, and a bootstrapping procedure was used to test the indirect links in the model.

Results: Along the "bright" path: Autonomy support at the dental clinic was positively associated with need satisfaction in treatment, which was positively associated with autonomous motivation for dental treatment and reappraisal of dental anxiety. Further, autonomous motivation was positively related to dental attendance, which in turn predicted oral health. Also, both autonomous motivation and reappraisal of anxiety were negatively related to avoiding dental appointments. Along the "dark" path: Conditional regard at the dental clinic positively predicted need frustration in treatment, which positively predicted dental anxiety. In turn, dental anxiety positively predicted avoiding appointments, along with the negative predictions by autonomy and anxiety reappraisal. Finally, oral health was negatively predicted by avoiding appointments. A bootstrapping procedure indicated that all indirect links in the model were supported. A SEM fit the data very well.

Conclusions: Because of the high level of explained variances for dental attendance (42%) and avoiding dental appointments (52%), promoting autonomy support and avoiding conditional regard at the dental clinic may be important for patients' oral health.

KEYWORDS
avoiding dental appointments, dental anxiety, dental attendance, oral health, reappraisal of dental anxiety, Self-determined motivation

1 | INTRODUCTION

Dental attendance and not avoiding dental appointments are important contributors to people's oral health.[1–3] The benefits of dental attendance include better oral health as indicated by less untreated decay, a lower rate of tooth loss, a higher number of functioning teeth, and less bacterial plaque and calculus on the teeth, as well as better oral self-care behaviours, and less anxiety and pain.[2,3]

It is recommended for healthy adults to visit their dentist regularly at least once a year,[4] which has been a reference indicator in the Nordic countries,[5] but regular dental attendance levels are low worldwide. In the UK, only about 50% of young adults and 61% of adults

visited their dentist the previous year.[6] The corresponding figures for Norway and Iran were 73% and 56%, respectively.[7,8]

1.1 | Self-determination theory

Why is it that patients do not follow prescriptions of dental attendance as recommended? In this connection, we examine self-determination theory (SDT;[9]), which describes dental clinic contexts as being autonomy supportive and/or controlling (ie using conditional regard). SDT proposes and substantial research has confirmed that, when an oral health care treatment is carried out in an autonomy-supportive way, positive outcomes such as need satisfaction in treatment, autonomous motivation for treatment, dental attendance, and oral health will be a more likely outcome.[7,10,11] Conversely, using conditional regard or being more controlling in treatment of patients should, according to SDT and research in other fields than oral health, result in more negative outcomes.[12] In the following, autonomy support represents the start of the "bright" motivational pathway towards dental attendance and oral health, whereas conditional regard represents the start of the "dark" motivational pathway towards avoiding dental appointments and reduced oral health (see Figure 1). Although the "bright" motivational pathway has received some attention in dental research,[7,10] the corresponding "dark" motivational pathway initiated by conditional regard and need frustration have until now been absent in this research.

1.2 | The "bright" motivational pathway towards dental attendance and oral health

In a series of studies of Halvari and colleagues, an autonomy-supportive style, need satisfaction, and autonomous types of motivation for oral health behaviours, were studied in relation to oral self-care behaviours and oral health,[13] oral self-care behaviours and dental attendance,[7] and oral health-related quality of life, well-being, and oral health.[14] These cross-sectional studies supported the

existence of the "bright" motivational pathway towards dental behaviours and oral health. In addition, and more important, these findings were supported by two randomized controlled trials in which reductions in bacterial dental plaque and gingivitis over 5-7 months were the dependent measures.[10,15]

The unique characteristic of the "bright" side of the model tested in the present study start with an assumption, based on SDT and the research described above, that autonomy-supportive oral health care provided by oral health care professionals would be associated with high need satisfaction in treatment among patients. Autonomy-supportive contexts are defined as "ones in which significant others offer choice, provide a meaningful rationale, minimize pressure, and acknowledge the target individual's feelings and perspectives" ([16] p. 117). In turn, need satisfaction would result in high autonomous motivation for treatment. Because autonomy support also has been shown to be positively associated with autonomous motivation, autonomy support is expected to be indirectly associated with autonomous motivation through need satisfaction.[7] Autonomous motivation is formed in health settings by identified and integrated behavioural regulations. When behaviour is regulated by identification, it is personally accepted as instrumentally important, as when the patient understands the value of dental attendance for promoting long-term health.[9] Integrated regulation is the most autonomous internalized motivation in which the behaviour is brought into a consistent and harmonious relation with other goals, values, and needs that make up the core self of the patient. An example is parents who value and pursue visits to the dentist for their own health, and thus model it for their children.[7]

A new construct in this "bright" path towards oral health care behaviours and oral health is reappraisal of dental anxiety. It is a cognitive strategy used to reduce the negative impact of dental anxiety by changing the way the patient thinks about the treatment situation. Following Gross and John,[17] reappraisal can down-regulate dental anxiety and thus successfully reduce the experiential and behavioural components of the anxiety. Because reappraisal has been
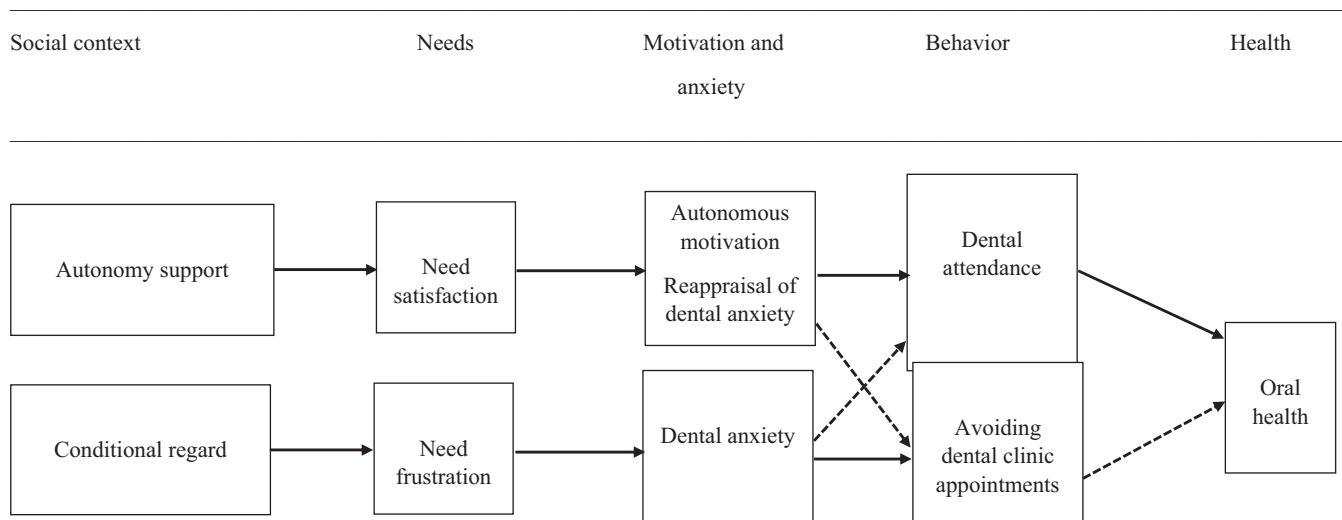
Social context	Needs	Motivation and anxiety	Behavior	Health

FIGURE 1 Theoretical model. Dotted arrows are expected to illustrate negative correlations

positively associated with autonomy and well-being,[17] we expected it to be a positive predictor, along with autonomous motivation, of oral health care behaviours and outcomes. More specifically, we expected both autonomy and anxiety reappraisal to positively predict dental attendance and to negatively predict treatment avoidance. Further, we expected reappraisal of dental anxiety, like autonomy, to be indirectly predicted by autonomy support through need satisfaction, which was expected to be a direct predictor of both variables. Finally, we expected dental attendance to predict better oral health. Prior research providing support for these hypotheses is quite strong,[7] although anxiety reappraisal has not previously been investigated in the SDT-related studies of positive oral health behaviours and experiences.

1.3 | The "dark" motivational path

Conditional regard (CR) is a socialization strategy used by oral health care professionals to get their patients to enact healthy oral behaviours.[12] CR can be both positive and negative: The practice of giving more attention and affection when patients act as expected is labelled conditional positive regard (CPR), whereas the practice of withdrawing attention and affection when the patients do not act according to expectations is labelled conditional negative regard (CNR).[12,18] In the present study, we included both CPR and CNR in the umbrella concept of CR because these two different concepts have been found to have different, although relevant, negative emotional and behavioural consequences—namely internal pressure for CPR and dysregulation for CNR.[12] We included conditional regard in this research because it, especially its negative form, has received virtually no attention in dental research.

Theory and research indicates that conditional regard is positively associated with students' need frustration,[19,20] which is in particular harmful for motivation and has pathogenic consequences.[19,21] Thwarting need satisfaction using conditional regard as a strategy may frustrate the basic psychological needs for competence, relatedness, and autonomy. To illustrate, withdrawal of positive feedback may leave patients feeling ineffective in interacting with the environment and thus frustrate their need for competence.[22] Further, withdrawal of attention and care may result in patients feeling alone and frustrate their need for relatedness,[23] whereas lack of open discussion regarding treatment alternatives may undermine patients' feeling of choice and volition and thus frustrate their need for autonomy.[9]

Conditional regard is used by oral health care professionals to prompt their patients to comply with their treatment expectations.[12] When patients have to comply with these expectations to get the attention and care of the practitioners, frustration of patients' need for autonomy is likely to be a consequence.[12] In turn, need frustration is hypothesized to yield dental anxiety. For example, a study by Israeli-Halevi[18] showed that maternal conditional regard strongly predicted adolescents' introjected motivation to suppress anxiety (eg not showing their anxiety to avoid feeling ashamed or to feel like a good person). Because other literature indicates that need frustration may mediate this relation,[12] we expected need frustration to be positively

linked to dental anxiety. In the dental field, results from need satisfaction research[7] indicated that low need satisfaction in treatment would be strongly associated with high dental anxiety, defined as fear of dental treatment or certain aspects of it.[24] Low need satisfaction may not imply need frustration, but over time the consequences of both are likely to be types of ill-being, pursuit of need substitutes, and various other forms of maladaptive functioning.[20] Other research has shown that need satisfaction and need frustration are strongly negatively correlated, indicating that high need frustration implies very low need satisfaction.[25] Thus, need frustration was expected to be positively associated with dental anxiety.

Dental anxiety has been found to be strongly linked to avoidance of making a dental clinic appointment[7] and weakly but significantly associated with low regular dental clinic attendance.[7,26,27] Avoidance of making dental appointments and attending regular dental appointments are different constructs sharing only 10% common variance and not being highly negatively correlated.[7] Further, the low or moderate correlations found between dental anxiety and regular dental attendance indicate that other factors than dental anxiety, such as autonomous motivation for treatment and planning dental visits, are likely to be the primary predictors of regular attendance.[7,27] Thus, as mentioned, in the present study we included autonomous motivation as a predictor of dental attendance, but we expected that dental anxiety would negatively predict regular dental attendance and positively predict avoidance of making a dental appointment.

Self-report measures of oral health similar to those used in the present study have been shown to be reliable and valid indicators of physical health in general, overall well-being, and clinical assessment of oral health.[28–32] In the dental context, self-care behaviours such as regular dental attendance and not avoiding dental appointments are important factors shown to be associated with high scores on oral health.[1–3,33–38] Thus, we expected that regular dental attendance would be positively associated with oral health, whereas avoidance of making dental appointments would be negatively linked to oral health.

1.4 | The hypothesized model

In the "bright" motivational pathway towards good oral health, we hypothesized that: Autonomy support at the dental clinic would be positively associated with need satisfaction in treatment, which would, in turn, be positively associated with autonomous motivation for dental treatment and reappraisal of anxiety (see Figure 1). In turn, autonomous motivation and reappraisal would be positively associated with dental attendance, and negatively linked with avoidance of making a clinic appointment. In the "dark" motivational pathway towards reduced oral health, we hypothesized that conditional regard at the dental clinic would positively predict need frustration in treatment, which would positively predict dental anxiety. Further, dental anxiety was expected to be negatively associated with dental attendance and positively linked to avoidance of making dental appointments. Finally, oral health would be positively predicted by dental attendance, and negatively predicted by avoiding dental appointments.

2 | STUDY POPULATION AND METHODS

2.1 | Participants

Students from all study disciplines at the University of Oslo were invited to participate in the study. They were informed about the aim of the study, and they gave their informed consent to participate. Some of them answered the questionnaire immediately, but due to commitments most of the students returned them by mail (a stamped envelope was provided). No incentives were offered for participation. Of a total of slightly above 27 000 students, 838 questionnaires were handed out and 322 were returned (38%). Participants' ages ranged from 18 to 49 years (M=25.5, SD=2.8). More females than males responded to the questionnaire (females=73.6%).

The participants' answers on several questions related to their dental history indicated that the majority had visited their dentist or dental hygienist during the last year (71.7%), and that they had visited this oral health care professional nearly three times (M=2.73, SD=1.67). They further reported that this oral health care professional in most cases was a female (64.8%) and that slightly more visits were at public rather than private clinics (53.5%). When answering the questions, participants were asked to recall their last visit to their oral health care professional and report whether this person was a dental hygienist or a dentist. Of the participants, 84.5% recalled their dentist.

2.2 | Translation of measures and their reliabilities

All questionnaire measures described below were translated to Norwegian, and retranslated to English, and adapted following the procedures suggested by Beaton, Bombardier, Guillemin, and Ferraz.[39] For reliabilities of these scales, see Table 1.

2.3 | Design of questionnaire

Before the participants responded to the items in the questionnaire, they were introduced to their own clinic context by the following instructions and questions: "Think back on your last visit to a dental hygienist or dentist. It is important that you try to think about the treatment and your experience with this oral health care professional". This introduction was followed by questions on who this oral health care professional was (a dental hygienist or a dentist, a female or a male), the number of visits to this oral health care professional, type of clinic (private or public), and time since last visit. "If you answered "dental hygienist" in question 1, please have this person in mind and answer the following questions with reference to your dental hygienist. However, if you answered "dentist" in question 1, please answer the following questions with reference to your dentist".

2.3.1 | Perceived autonomy support at the dental clinic

This concept was measured with the six-item short version of the Health Care Climate Questionnaire (HCCQ; Williams & Deci, [40]). See the questionnaire in the Appendix. The items were averaged to reflect autonomy support. This scale was tested in Norway among dental patients.[7] The results indicated good internal consistency and validity for the HCCQ.

2.3.2 | Conditional regard (CR) at the dental clinic

CR was measured with 10 items adapted from Roth.[12] See the questionnaire in Appendix. The items were averaged to reflect conditional regard. This scale has yielded results indicating good internal consistency and validity.[12]

TABLE 1 Means, SDs, skewness, and Pearson correlations among variables (N=322). Cronbach α coefficients in the diagonal

	M	SD	Skew	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Autonomy support	4.8	1.2	−0.2	.84											
2. Conditional regard	2.5	1.3	0.6	−.40	.95										
3. Need satisfaction	5.0	1.1	-0.2	.65	−.50	.88									
4. Need frustration	1.9	1.0	1.4	−.50	.72	−.64	.93								
5. Autonomous motivation	4.0	1.7	0.1	.31	−.12	.38	−.21	.90							
6. Reappraisal of anxiety	4.4	1.2	−0.4	.11	−.04	.19	−.06	.07	.90						
7. Dental anxiety	2.1	0.8	1.0	−.25	.37	−.39	.51	−.12	−.06	.85					
8. Dental attendance	1.8	0.8	0.4	.25	−.13	.23	−.13	.55	.04	−.11	—				
9. Avoiding appointments	1.4	0.9	2.1	−.16	.17	−.26	.35	−.21	−.16	.49	−.15	.86			
10. Oral health	3.4	0.9	−0.1	.14	−.23	.36	−.26	.26	.04	−.17	.27	−.22	.92		
11. Age	25.5	5.3	2.8	.12	−.10	.15	−.18	.12	−.12	−.14	−.14	.03	.02	—	
12. Sex[a]	1.3	0.4	0.1	−.11	.14	−.11	.07	−.13	−.09	−.05	−.09	.01	−.17	−.08	—

[a]Spearman's point biserial correlations are used between sex and all other variables. Females=1; males=2.
r>.11, P<.05; r>.14, P<.01; r>.18, P<.001; two-tailed tests.

2.3.3 | Basic psychological needs at the clinic

Need satisfaction was measured with the Basic Psychological Need Satisfaction in Exercise Scale,[41] adapted to the dental clinic domain. It consists of nine items intended to measure satisfaction of the three basic needs for competence, autonomy, and social relatedness with three items each. See the questionnaire in the Appendix. The items were averaged to reflect need satisfaction (3 items each). Among dental patients,[7] this scale yielded good internal consistency and validity scores.

2.3.4 | Need frustration at the clinic

Need frustration was measured using the Psychological Needs Thwarting Scale by Bartholomew et al.,[42] which was adapted to the dental treatment context. See the questionnaire in the Appendix. The items were averaged to reflect need frustration (3-4 items each). In a study among health managers in Norway, the needs frustration measures yielded acceptable reliabilities (ranged from .71 to .88) and indications of discriminant validity.[25]

2.3.5 | Autonomous motivation for treatment

This construct was measured with the Self-Regulation Questionnaire for Dental Treatment, SRQDT; Halvari et al.[7] The scale comprises four items for autonomous motivation for treatment. See the questionnaire in the Appendix. The items were averaged to reflect autonomous motivation. Reliability and validity indications for the SRQDT are presented elsewhere.[7]

2.3.6 | Reappraisal of dental anxiety

Reappraisal was measured with the Emotion Regulation Questionnaire[17] adapted to dental anxiety. See the questionnaire in the Appendix. The items were averaged to reflect anxiety reappraisal. Reliabilities varied from .75 to .82 in the study by Gross and John.[17]

2.3.7 | Anxiety for dental treatment

Anxiety was measured by the five-item Modified Dental Anxiety Scale by Humpris et al.[26] An example item is: "If you were sitting in the waiting room (waiting for treatment), how would you feel?" Participants responded on a five-point scale ranging from 1 (not anxious) to 5 (extremely anxious). The items were averaged to reflect anxiety for dental treatment. In a UK study, the reliability of this scale was .89; test-retest was .82.[26]

2.3.8 | Assessment of clinic attendance and avoidance of dental appointments

Clinic attendance was measured with this question: "In general, would you say you visit your oral health care professional: regularly (score 3), occasionally (score 2), or only when you are in pain/or trouble (score 1). This scale is the same as used frequently in research on dental attendance.[26] The measure of avoiding making a dental appointment is from the Dental Fear Survey by Milgrom, Weinstein, & Getz.[43] Its focus is on avoidance of dentistry and consists of the following two questions: "Has fear or worry ever caused you to put off making an appointment 1) with a dental hygienist? 2) with a dentist?" Responses were: 1 (never), 2 (once or twice), 3 (a few times), 4 (often), and 5 (nearly every time). The items were averaged to reflect avoiding appointments.

2.3.9 | Self-rated oral health

This was measured with two questions. The first is from the SF-36, by Ware & Sherbourne[44]: "How would you say your oral health is now?" The second question is from a Swedish study by Femia, Zarit, & Johansson[45]: "How would you evaluate your oral health in relation to others of your own age?" Participants responded to the questions on a five-point scale ranging from 1 (bad) to 5 (excellent). The items were averaged to reflect self-rated oral health. For more psychometric information about this scale, see.[13] Participants also indicated their gender and their age.

2.4 | Data analyses

The data were analysed by use of zero-order correlations, structural equation modelling with LISREL, version 8.80, and indirect links in the model were tested using the bootstrapping procedure described by Preacher and Hayes.[46] In the LISREL test of the SDT process model (Figure 1), the oral health variable and the two behaviour variables dental attendance and avoiding appointments were treated as observed variables, due to the large number of variables and indicators (ie scale items) relative to the sample size. All other variables were latent and some of them were parcelled to simplify the model. That is, we randomly assigned items for autonomy support, conditional regard, dental anxiety, and reappraisal of dental anxiety into three parcels, each with 1-4 items, as recommended by Little, Cunningham, Shahar, and Widaman.[47] Finally, we used satisfaction and frustration, respectively, of the needs for competence, autonomy, and relatedness to be indicators of the variables need satisfaction and need frustration. For autonomous motivation four items were used as indicators.

To evaluate the fit of the maximum likelihood models tested, we used the Chi-square likelihood ratio (χ^2), the χ^2/df ratio, the root mean square error of approximation (RMSEA), the Comparative Fit Index (CFI), and the Incremental Fit Index (IFI).[48,49] A good fit should have a $\chi^2/df < 3.0$, a value close to or lower than .06 for the RMSEA, a value close to or lower than .08 for the SRMR, and a value close to or higher than .95 for the CFI and IFI.

According to the two-stage procedure proposed by Bollen,[48] the measurement model should have an acceptable fit before it is included in the test of the structural model.

3 | RESULTS

3.1 | Descriptive statistics and reliability

The means, standard deviations, skewness values, and reliabilities for all variables appear in Table 1. Skewness values and reliability

of measures are acceptable, except for the borderline skew value of avoiding appointments. Due to this, the links in the model tested (see Figure 2) involving avoiding appointments were also tested using a nonparameter procedure. The skew value of age is also high, but is not used in the test of the model.

3.2 | Hypotheses testing

3.2.1 | Theoretical model

The zero-order correlations in Table 1 are all in line with the expectations, except that reappraisal of dental anxiety was not significantly related to dental attendance.

3.2.2 | Measurement model

The measurement model was tested with all variables and indicators described and was found to fit the data well [χ^2 (df=234, N=322)=520.41, P< .001; χ^2/df=2.22; RMSEA (95% CI)=.062 (.055, .069); CFI=.96; IFI=.97; SRMR=.052] In this measurement model all factor loadings (in parentheses) were significant, for autonomy support (.71, .73, .79), for conditional regard (.77, .78, .80), for need satisfaction (.58, .83, .84), for need frustration (.78, .84, .85), for autonomous motivation (.48, .93, .95, .96), for reappraisal of dental anxiety (.68, .86, .91), for dental anxiety (.79, .89, .91), and for the three observed variables .87 for dental attendance, .87 for avoiding dental appointments, and .91 for oral health.

3.2.3 | Structural model

The structural model was tested with this measurement model included. In addition, it included all hypothesized significant and nonsignificant paths and also yielded a good fit [χ^2 (df=262, N=322)=612.90, P<.001; χ^2/df =2.34; RMSEA (90% CI) = .065 (.058, .071); CFI=.95; IFI=.95; SRMR=.083]. The standardized parameter estimates are shown in Figure 2. Of the hypothesized paths, only two were nonsignificant, the ones from reappraisal of anxiety and dental anxiety with dental attendance.

Because the variable "avoiding dental clinic appointment" had a borderline skew value of 2.1 we also used a nonparametric bootstrapping procedure by Preacher & Hayes,[46] to test the links that included this variable. These results supported the SEM results: (i) dental anxiety positively predicted avoiding appointments (.49, P<.001), which negatively predicted oral health (−.20, P<.01); (ii) reappraisal of dental anxiety negatively predicted avoiding appointments (−.11, P<.01), which negatively predicted oral health (−.26, P<.001); and (iii) autonomous motivation negatively predicted avoiding appointments (−.10, P<.001), which negatively predicted oral health (−.20, P<.001).

3.3 | Tests of indirect links

We tested the indirect links in Figure 2 using the bootstrapping procedure described by Preacher and Hayes.[46] The analyses indicated that all of the indirect associations were significantly supported because the bias-corrected 95% confidence intervals (for the bands of
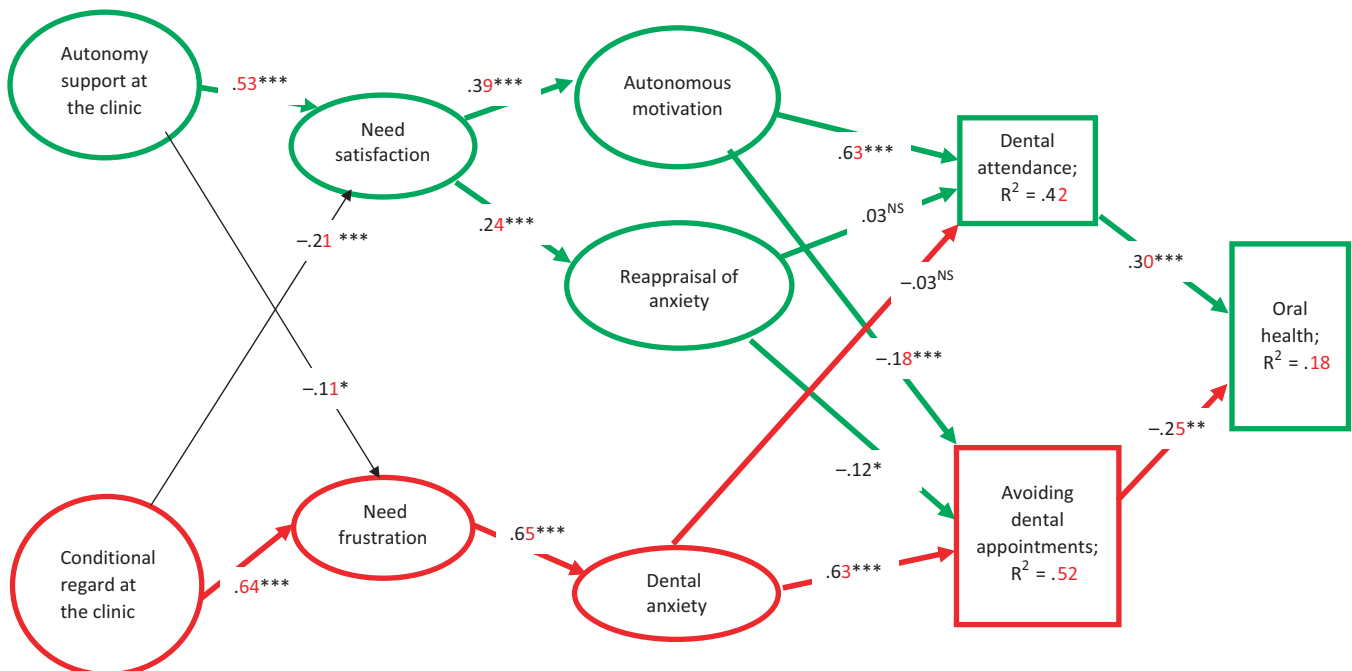

FIGURE 2 Standardized parameter (regression) estimates depicting the relations in the structural model of motivation, anxiety, dental behaviour, and health [X^2 (df=262, N=322)=612.90, P<.001; χ^2/df=2.34; RMSEA (90% CI)=.065 (.058, .071); CFI=.95; IFI=.95; SRMR=.083]. *P<.05; **P<.01; ***P<.001; NS=Not Significant. Due to presentation clarity, error terms and factor loadings are omitted. All variables are latent, except the observed dental behaviour variables and the oral health variable which appear in boxes to the right in the model

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TABLE 2 Tests of indirect links emerging in Figure 2

Independent variable (IV)		Mediator (M)		Dependent variable (DV)	Point estim	SE	a*b-path Z	Bootstrapping BC 95% CI	
								Lower	Upper
1. Autonomy support	→	Need satisfaction	→	Autonomous motivation	0.27	0.06	4.53***	0.15	0.40
2. Autonomy support	→	Need satisfaction	→	Reappraisal of anxiety	0.12	0.05	2.67**	0.03	0.21
3. Autonomy support	→	Need frustration	→	Dental anxiety	−0.15	0.02	−6.51***	−0.21	−0.11
4. Conditional regard	→	Need frustration	→	Dental anxiety	0.21	0.03	6.58***	0.14	0.18
5. Conditional regard	→	Need satisfaction	→	Autonomous motivation	−0.27	0.05	−5.91***	−0.38	−0.19
6. Conditional regard	→	Need satisfaction	→	Reappraisal of anxiety	−0.10	0.03	−3.36**	−0.17	−0.05
7. Need satisfaction	→	Autonomous motivation	→	Dental attendance	−0.15	0.03	−6.00***	−0.02	−0.11
8. Need satisfaction	→	Autonomous motivation	→	Avoiding appointments	−0.04	0.02	2.12*	−0.07	−0.01
9. Need satisfaction	→	Reappraisal of anxiety	→	Avoiding appointments	−0.02	0.01	−1.81	−0.05	−0.002
10. Need frustration	→	Dental anxiety	→	Avoiding appointments	0.18	0.03	6.17***	0.11	0.26
11. Autonomous motivation	→	Dental attendance	→	Oral health	0.06	0.02	3.10**	0.03	0.10
12. Autonomous motivation	→	Avoiding appointments	→	Oral health	0.02	0.01	2.33*	0.003	0.04
13. Reappraisal of anxiety	→	Avoiding appointments	→	Oral health	0.03	0.01	2.33*	0.01	0.06
14. Anxiety	→	Avoiding appointments	→	Oral health	−0.10	0.04	−2.64**	−0.19	−0.02

BC, bias corrected; 5000 bootstrap samples.
a-path = IV → M; b-path = M → DV.
*P<.05.
**P<.01.
***P<.001.

products of coefficients after *n* resamplings) did not include zero or oppositely valued coefficients (see Table 2).

4 | DISCUSSION

Autonomy support predicted high need satisfaction in treatment, which was positively linked with autonomous motivation for dental treatment and reappraisal of dental anxiety. In turn, autonomous motivation was positively related to dental attendance and negatively to avoiding making dental appointments. Reappraisal was associated negatively with a tendency to avoid appointments. In addition, autonomous motivation was indirectly positively linked to self-rated oral health through regular attendance and negatively related to oral health through avoiding appointments. These results representing the bright path towards oral health care behaviours and health are consistent with recent research by Halvari et al.,[7,10,14] although the reappraisal of dental anxiety has not been tested in a self-determination theory examination of oral health. Here, reappraisal of dental anxiety was involved in the indirect negative link between need satisfaction and avoiding dental appointments. This link is interesting because patients can learn to reappraise, reduce, or change their negative emotions (eg dental anxiety) into something less negative,[17] thus making the influence of reappraisal of dental anxiety more positive. Future need supportive longitudinal trials may promote such learning, which may help patients not to avoid making dental clinic appointments.

For the first time in the dental field, conditional regard at the dental clinic was found to positively predict need frustration in treatment, which was positively linked to high dental anxiety. In turn, dental anxiety was strongly linked to avoiding making a dental clinic appointment, and indirectly negatively related to self-rated oral health. Thus, conveying conditional regard in the clinic seems to be an ineffective method of promoting dental attendance and oral health.

The present study emphasizes the importance of autonomy support, need satisfaction, and autonomous motivation in fostering positive oral health-related outcomes, and support previous findings.[7,10,13,14] Thus, the question remains how we can create a social climate in dental clinics that promotes these processes. According to SDT by Deci & Ryan,[9] this can be done by providing options, choices, and a meaningful rationale for why oral hygiene and dental attendance is important, in a setting with support for autonomy, competence, and relatedness. In providing such support, oral health care professionals

can reflect on patient perspectives and support their initiatives, minimize controlling language, and remain nonjudgmental. Such need support is expected to increase autonomous motivation for oral hygiene and dental attendance and result in persistent healthy behaviours and oral health. Research indicates that health professionals can be trained to be more autonomy supportive and less controlling.[40] Experimental research in the dental field found that more autonomy support from oral health care professionals resulted in more autonomous motivation for treatment and more perceived oral health care competence among patients, which resulted in improvement in oral health.[10,15] Support for autonomy is considered an important outcome within medical ethics and a critical health care outcome in its own right promoting patient welfare (ie appropriate oral health care behaviours and oral health), which is supported by recent research by Ng et al.[11] The nonsignificant link between dental anxiety and dental attendance do not support the weak but significant negative link found in most studies.[7,26,27] However, when this relation between dental anxiety and dental attendance is controlled for the significant influence of autonomous motivation, as is the case in the present study, dental anxiety becomes a nonsignificant predictor. Thus, research testing these links should be replicated.

Symmetrical links (eg between conditional regard and need frustration) were stronger than cross-paths (eg between conditional regard and need satisfaction) tested in Figure 2. However, the weaker correlations were also significant. This suggests that patients experience less need satisfaction and autonomous types of motivation when they perceive their oral health care professionals using conditional regard strategies, a finding supported by research in the sport field.[42]

Conditional regard is a detrimental strategy for oral health behaviour and oral health. When patients perceive that their perspectives are not met but feel that they have to follow the expectations of others to receive positive attention, need frustration might follow, which would result in dental anxiety.[7,12,18,19] It is interesting and important that dental anxiety is so strongly positively linked to need frustration and conditional regard, but also indirectly negatively associated with autonomy support. Thus, to train oral health care professionals to increase their use of autonomy support and decrease their use of conditional regard strategies would probably have a huge effect on reduction in both need frustration and dental anxiety. Because dental anxiety is strongly associated with avoiding dental appointments, a reduction in anxiety may play a key role for the oral health of patients.[50] This is also important because about one of five adults experience their dental anxiety negatively,[27] that is, it interferes negatively with their dental appointments. In turn, this nonattendance leads to more dental disease and pain and, in turn, even more dental anxiety.[51,52] It is important to turn this negative circle towards a more positive one—and this can be done by training oral health care professionals to be more autonomy supportive and less controlling in their practice.[40]

Of all the paths examined in this research, the only ones that were not significant were those from anxiety and reappraisal of anxiety to attendance, although both were related to avoidance of making appointments. Dental attendance in this study concerned visiting an oral health care professional on a regular basis. In other words, these patients have made a decision to get ongoing oral care and for them anxiety or its reappraisal does not affect this. In contrast, avoiding making appointments is concerned with not taking the initiative to make an appointment and begin regular treatments because of the fear of discomfort. So, it makes sense that autonomous motivation would strongly predict regular attendance, and anxiety or its reappraisal would relate to avoiding making an appointment but not to regular attendance.

In fact, the constructs of regular dental attendance is not the opposite of avoiding clinic appointments, and the two constructs share only 2% common variance ($r=-.15$) in the present study. These results have also received prior support by a recent study.[7] Thus, it would be important for future research on motivation and anxiety for dental treatment to include both regular dental attendance and avoiding making dental clinic appointments, because their antecedents and consequences are quite different. Indeed, they belong to the different motivational pathways towards oral health, namely, the "bright" and the "dark" ones.

4.1 | Limitations

Many limitations apply to the present study. *First*, self-reports were appropriate for perceived autonomy support, conditional regard, need satisfaction, need frustration, and the motivation and anxiety constructs. However, for dental attendance, avoiding appointments, and oral health more objective measures could have strengthened the study by reducing common method bias. However, if construct validity of self-report measures are demonstrated, other methods are not necessarily better.[53] In the present study, only well-validated measures were used. *Second*, the current sample is a convenience sample from a specific population of students. The sample was not selected to be representative of all students, so caution must be taken when it comes to generalizing the results. However, the purpose of the present study was to test the links between variables derived from an universal theory, assuming that constructs such as autonomous motivation, needs, and anxiety are more or less present in all individuals.[9] This means we tried to maximize the internal validity of the study, assuming that the relations between variables would be the same independent of sample variations. *Third*, the model tested was not controlled for educational level and socio-economic status, two factors that are known to influence dental attendance and oral health. However, in a similar sample with students from the University of Oslo, the links between SDT motivation variables and oral health-related variables are the same even after controlling for four socio-economic variables, including education level.[13] *Fourth*, the study has the limitations associated with being cross-sectional and the absence of a design allowing randomized control and longitudinal data implies that conclusions regarding causality cannot be inferred.[48] The analysis of the hypothesized model was performed in SEM with mostly latent variables, which is a strength, but the arrows between variables do not imply causality. Regarding this, it is important to note that randomized controlled trials have been conducted in the dental field supporting the role of autonomy support influencing oral health care behaviours and oral health.[10,15]

5 | CLINICAL RELEVANCE AND CONCLUSION

5.1 | Rationale and principal findings

This study makes a contribution because it is the first study of oral health that differentiates the "bright" and "dark" motivational pathways towards nondental attendance, represented by avoiding making dental clinic appointments, and regular dental attendance. Avoiding a dental clinic appointment is mainly predicted by dental anxiety, which is predicted by conditional regard at the dental clinic and need frustration in treatment. Conversely, regular dental attendance is mainly predicted by autonomous motivation for treatment, which is predicted by autonomy support at the dental clinic and need satisfaction in treatment. These findings are important because regular dental attendance leads to improved oral health and avoiding dental appointments leads to reduced oral health among people worldwide.

5.2 | Practical implication

Research indicates that health professionals can be trained to be more autonomy supportive and less controlling,[40] which will result in more autonomous motivation for dental treatment and more perceived oral health care competence among patients, which, in turn, will result in improvement in oral health.[10,15]

CONFLICT OF INTEREST

The authors declare that they are not subject to any conflict of interest.

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APPENDIX

THE QUESTIONNAIRE

Autonomy Support at the Dental Clinic

"Think back to your last visit to your oral health care professional (dentist or dental hygienist). It is important that you try to think about the treatment and your experiences with this oral health care professional." This introduction was followed by six questions: was this oral health care professional a dental hygienist or a dentist, a female or a male, how many visits have there been to this oral health care professional, what type of clinic was it (public or private), how long has it been since the last visit, and what is the number of visits during the last 2 years. They were then told: "In the section below we ask you about your feelings when you go to treatment. Please answer the following questions with reference to your oral health care professional."

Responses are given on a scale varying from strongly disagree (1) to strongly agree (7).

1. I feel that my oral health care professional offers me possibilities and options.
2. I feel that my oral health care professional understands me.
3. My oral health care professional shows that s/he believes in my ability to take good care of my oral health
4. My oral health care professional encourages me to ask questions.
5. My oral health care professional listens to the way I would like to take care of my oral health
6. My oral health care professional tries to understand my views before s/he suggests new ways of doing things

CONDITIONAL REGARD AT THE DENTAL CLINIC
The same stem and scale was used as above.

1. If (or when) I care well for my teeth, I feel that my oral health care professional supports me more than s/he usually does.
2. If (or when) I cooperate with my oral health care professional, I feel that s/he likes me more than usual.
3. If (or when) I follow the advice from my oral health care professional, I feel that s/he appreciates me much more than usual.
4. If (or when) I am upset but do not express it, I feel that my oral health care professional appreciate me more than usual.
5. If (or when) I am not satisfied with the treatment but succeed in covering it, I feel that my oral health care professional likes me more than usual.
6. If I don't have time to care well for my teeth, I feel less worthy as a person in treatment.

7. If I fail to follow the prescriptions given from my oral health professional, I feel that s/he likes me less than usual.
8. If (or when) I express my dissatisfaction in treatment, I would feel that my oral health care professional would care less for me.
9. If (or when) I don't keep my appointments with my oral health care professional, s/he lets me feel that I am not a worthy person.
10. If (or when) I'm not clever enough performing my oral home care, my oral health care professional would show me less care and affection.

NEED SATISFACTION IN TREATMENT
When you are in dental treatment, how true or untrue are the following statements?

Responses are given on a scale varying from not at all true (1) to very true (7).

1. I feel comfortable when I am with my oral health care professional.
2. I feel that I and my oral health care professional associate in a friendly/pleasant way.
3. I feel very much at ease with my oral health care professional.
4. I feel I have been making a huge progress with respect to my oral health goals.
5. I feel that I execute my oral health care very well.
6. I feel that I can manage my oral home care.
7. I feel very strongly that the oral treatment/examination fits perfectly the way I prefer it to be
8. I feel that the way I am treated/cared about at oral examinations is definitely an expression of my wishes.
9. I feel in a good way that I have the opportunity to make choices with respect to treatment/examination.

NEED FRUSTRATION IN TREATMENT
When you are in dental treatment, how true or untrue are the following statements?

Responses are given on a scale varying from not at all true (1) to very true (7).

1. I feel prevented from making choices with regard to treatment.
2. I feel pushed to behave in certain ways when I am in treatment.
3. I feel forced to follow decisions my oral health care professional makes for me.
4. I feel under pressure to agree in the treatment decided for me.
5. There are situations where I am made to feel inadequate in treatment.
6. There are times when I am told things that make me feel incompetent.
7. Situations occur in which I am made to feel incapable.
8. I feel inadequate because I am not given opportunities to communicate.
9. I feel I am rejected under treatment.
10. I feel my oral health care professional can be dismissive of me.

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11. There are times when I feel my oral health care professional dislikes me.

AUTONOMOUS MOTIVATION FOR TREATMENT

Before the participants responded to these questions, they were encouraged to continue thinking back to their last visit to their oral health care professional.

Responses are given on a scale varying from not at all true (1) to very true (7).

A: I decided to enter treatment at my oral health care professional because:
1. I feel it is important for me personally to do it.
2. It has become a well-established part of my life.

B: If I remain in treatment it will probably be because:
1. I experience it as personally important
2. Going to treatment has become a natural habit for me.

REAPPRAISAL OF DENTAL ANXIETY

Responses are given on a scale varying from very much disagree (1) to very much agree (7).

When I am in dental treatment:

1. I control my anxiety for dental treatment by changing the way I think about the situation I'm in.
2. When I want to feel less negative stress in treatment, I change the way I'm thinking about the situation.
3. When I want to feel less upset and anxious, I change the way I'm thinking about the situation.
4. When I am anxious for dental treatment and want to experience more positive feelings, I change what I'm thinking about
5. When I'm faced with a stressful treatment, I make myself think about it in a way that helps me stay calm