

# Basic Tools for Dental Fear Detection by Dentists

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## Abstract

**Objectives:** Even though dental anxiety is common, it frequently goes unrecognised. Since 2020, COVID-19 has posed a health care concern. The purpose of this study was to assess dental fear as reported by patients and as identified by dentists. Validating a color-coded device for calculating dental fear was another goal. The impact of COVID-19 on attendance and fear was evaluated.

**Methods:** After the first (T1) and third waves (T2) of the pandemic, a cross-sectional study was carried out at the primary urgent dental care of Oulu, Finland, in the spring of 2020 and 2021. The Modified Dental Anxiety Scale (MDAS), Facial Image Scale (FIS), and a novel "traffic light" colour coding for dental dread were used to collect data for analyses (CCF). With the help of structured and open-ended questions, the impact of COVID-19 on dental fear and attendance was evaluated. 273 people who wished to remain anonymous filled out the surveys.

**Results:** Among the participants, 106 (38.8%) and 167 (61.2%) went to the dentist in T1 and T2, respectively. They were 45.1 years old on average. 10.6% of the individuals reported having a severe fear score on the MDAS of 19 or above. In the CCF "traffic light" system, 87% of individuals who had severe dental anxiety selected the colour red. The participants' and dentists' assessments of dental dread were only weakly correlated ( $P = .001$ ), and there was no agreement with the red code (Cohen's kappa value = 0.035). After the first wave (T1), the younger individuals' MDAS scores were higher than those of the older participants' ( $P = .021$ ). For those with the most severe self-reported dental fear as determined by the MDAS, COVID-19 had the greatest impact on dental attendance and dental dread.

**Conclusions:** Color-coded traffic lights are simple to use and appear to be effective for detecting severe dental phobia. They may be helpful tools, particularly given that it may be challenging for dentists to identify dental fear. For those who are most afraid, the COVID-19 pandemic has made dental care more difficult.

**Keywords:** Dental phobia; Dentist evaluating

## Introduction

Despite the fact that dental dread is common dentists frequently go unnoticed by it. It is understood that age and gender play a role in the frequency of dental phobia. And it alters for male and female patients in distinct ways over time. Dental fear can be measured with the aid of scales like the Modified Dental Anxiety Scale (MDAS), Facial Image Scale (FIS), and Visual Analogue Scale (VAS). Dental fear screening has been done with just one inquiry. Images with different codes or a "traffic light system" have previously been used in dental and medical care to indicate the level of pain or to help classify patients as high-risk patients, but not yet to identify patients who are afraid of the dentist. Particularly if a patient has a serious fear of the dentist, questionnaires, conversation, and behavioural observation are advised [1]. It must be remembered that even for skilled dental experts, identifying dental fear can be difficult. Due to the fear of infection, the COVID-19 pandemic may have had an impact on dental attendance as well as dental treatments. There is some evidence to suggest that dental phobia among oral surgery patients, dental emergency patients, and dentistry students may be increased as a result of the pandemic. The purpose of this study was to assess how dental fear is identified in primary care. The specific goal was to look into the correlations between the well-known dental fear scales Facial Image Scale (FIS) and Modified Dental Anxiety Scale (MDAS), as well as a 3-point scale or "traffic lights" colour codes for dental fear (CCF), among adults who were coming for urgent outpatient dental care [2] and were categorised by age and gender. Investigating the relationship between patients' self-reported dental fear and dentists' assessments was another explicit goal. Investigations were also conducted into how the COVID-19 epidemic affected attendance and dental anxiety.

## Methods

In this cross-sectional study, patients seeking dental urgent treatment at the primary health care clinic in the Finnish city of Oulu made up the study population. During their dental session, all willing patients over the age of 15 who met the requirements for urgent dental care were offered to take part in this survey. 277 (81.5%) of the 340 patients in this convenience sample agreed to take part [3]. If 50% of participants in this study reported having moderate or severe dental phobia, then 138 participants were required to reach the power of 80% and confidence interval of 95%: In previous surveys, 27% of Finnish individuals reported having dental anxiety. 8 In Finland, the first study sample (T1) was obtained following the so-called first wave of the COVID-19 pandemic in the months of June and July 2020, and the second study sample (T2) was obtained following the third wave in the months of April and May 2021. Different weekdays were represented by the study dates. The study group was excluded from those who required immediate emergency dental or medical care owing to a serious dental injury ( $n = 1$ ), may have required COVID-19 testing ( $n = 1$ ), or were not considered urgent dental patients [4] ( $n = 2$ ). All of

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the enrolled participants were able to comprehend the written content in the study procedure and the quizzes. The data used in the analysis (n = 273) came from the completed.

## Questionnaires

The MDAS,11,12, FIS,13, and CCF created for this study were among the questionnaires used to assess dental fear that were given to all participants. Before the dental procedure started, participants completed the questionnaires in the waiting area and returned them to the dentist's office in sealed envelopes. Although all questionnaires were filled out anonymously, data management techniques included consecutive numbering [5]. As background information, the participants' ages (in years) and genders (male/female/other/prefer not to say) were questioned. The MDAS questionnaire consists of 5 questions, each with 5 possible answers. A score of 1 indicates that you are not worried, and a score of 5 indicates that you are very anxious. The scores vary from 5 to 25 when added together. High dental anxiety is frequently represented by a cutoff of 19 points. In study reports<sup>24</sup>, the phrases nervous and dental fear are interchangeable; the term dental fear is used here. The five images on the FIS questionnaire depict the patient's current feelings, ranging from the most positive (happy) to the most negative (numbers 1 to 5). Using the colour codes (CCF; Figure), the participants were then asked to assess their own dental phobia at T2. Which shade best represents your dental phobia? Green indicates no or little fear, yellow indicates some dread, and red indicates a lot of fear. Dentists who volunteered to participate in the study (n = 24; 6 men and 18 women, or 96% of the dentists scheduled to provide emergency dental care during the study periods) marked the envelopes with CCF stickers without opening them: (1) green for no or low level of fear; (2) yellow for moderate fear; and (3) red for severe fear. In this way, the dentists selected the options that, in their judgement, best matched the participants' indicated levels of dental phobia. The dentists or researchers were unaware of the subjects' responses [6]. The dentists lacked any specialised training in measuring patients' levels of dental anxiety. The study protocol was pre-piloted with 4 patients by 4 dentists. Two questions about the impact of COVID-19 on participants' attendance at dental appointments and dental phobia were posed to them: "Has the COVID-19/coronavirus pandemic had an impact on your dental care attendance?/on your dental phobia?" the following possible responses: Yes, it has grown; No, it has shrunk; I'm not sure; it must have some other impact. If a participant selected the option: "some other effect," they had the chance to add free-form remarks to any of the COVID-19 pandemic questions.

## Statistics

Age-related descriptive statistics were presented as proportions, means, and standard deviations. To check for normalcy, the Kolmogorov-Smirnov test was employed. The MDAS could be broken down into trichotomized sum score categories for analysis: 5–9 = minimal dental anxiety; 10–18 = moderate; 19–25 = severe. 9 The colour codes were analysed as follows by categories as well as dichotomized: codes 1-2 (green and yellow) = low to moderate fear; codes 2-3 (yellow and red) = moderate to severe/strong fear; and codes 1 (green) = low fear. For context, participants were split into two groups based on gender and three groups based on age (29 years, 30–59 years, and 60 years). Only two gender options were listed in the tables since only one participant refused [7] to select any of the three alternatives, and no participant identified their gender as "other." The means of the MDAS sum scores and the participants' ages in groups T1 and T2 were compared using the independent-samples t test to determine whether

there would be any differences. A chi-square and Fisher exact test was run across variables gathered after the first and third COVID-19 waves, and cross-tabulation was utilised to analyse associations between variables throughout the entire study material (T1, T2). The agreement between patients' self-reported CCF and MDAS and between dentists' and patients' fear colour codes was measured using Cohen's kappa values. Statistics were considered significant for P values below .05. The Statistics Package for the Social Sciences was used to conduct the statistical analyses (SPSS, version 26.0, IBM, Inc.).

## Ethics

The Northern Ostrobothnia Hospital district in Finland (number 140/2020) and the City of Oulu (number 20/2020, OUKA/754/07.01.04.02/2020) both gave their approval for this study. According to the 2019 national guidelines and the Ethical Board of the Northern Ostrobothnia Hospital District, this questionnaire-based [8], anonymous study did not require a statement from the ethical board because it did not collect any personal information from the willing participants. Each participant received information and a pamphlet. By providing the study number, participants could anonymously withdraw their agreement for the study to utilise their data at any point. After the first and third waves of the pandemic during the research period, the rates of COVID-19 infection in Finland were less than 20 in 2020 and less than 250 in 2021 per 100,000 people. The Northern Ostrobothnia Hospital district and the City of Oulu modified their directions, which the researchers followed [9]. The data are stored at the University of Oulu in Finland and are made available upon the authors' reasonable request.

## Results

167 (61.2%) of the 273 study participants visited a dentist during T1, and 106 (38.8%) did so during T2. In comparison to men, there were more women (143, 52.4%) than men (129, 47.3%). The participants' average age was 45.1 years (SD, 16.4; min, 16 years; max, 90 years). At T1 and T2, the participant distribution by gender (P = .508) and age (T1 mean, 45.8 years; SD, 17.1 years; T2 mean, 43.9 years; SD, 15.2 years; P = .339) did not change statistically significantly from one another. 10.6% of the individuals in total reported having an MDAS 19. Using MDAS and FIS scores at T1 and T2, equal levels of dental fear were reported by men and women. After the initial wave, there were significant differences in MDAS sum scores between the various age groups (T1; P = .021). Dental fear was experienced by the youngest participants twice as frequently as the oldest. According to the MDAS sum scores at T1 and T2, there was no discernible difference between the average self-reported dental dread (T1 mean, 11.0; SD, 5.1; T2 mean, 11.6; SD, 5.3; P = .411). Although the oldest age group tended to provide the most favourable FIS ratings at T2, all three age groups had similar FIS scores. In 77.6% of the patients, self-reported CCF green was in agreement with MDAS total scores of 5 to 9. In 86.7% of the cases, patients who described their dental anxiety as CCF red or "extreme fear" had an MDAS score below 19. Nearly excellent agreement ( = 0.880) was found between self-reported red codes for extreme dental phobia and MDAS total score 19. According to their MDAS scores, 1 in 5 people who evaluated their dental fear using the colour code green or "no or low level of dental fear" indicated significant dental fear (10–18). According to the MDAS 19, none of the patients with a green code experienced extreme dental phobia. Overall, there was good agreement between CCF and MDAS sum scores (women: 0.761; men: 0.703). There was just a small amount of agreement ( = 0.087) between the patients' and dentists' colour codes. Following dichotomization, there

was no agreement between the red colour and anything else (men,  $p = 0.035$ ; women,  $p = 0.034$ ). The green colour, which represents low dental fear, had the highest agreement between patients' and dentists' assessments of dental fear using CCF. Following the dichotomization of green colour vs. other, Cohen's kappa value revealed a slight agreement ( $\kappa = 0.124$ ) between the dentists' estimation and women's dental dread [10]. Men's agreement was reasonable ( $r = 0.387$ ). When colour codes were dichotomized (red vs. other;  $P .001$ ), severe dental fear, which was represented by both men and women as having a red colour code, had the lowest agreement between dentists' and patients' fear levels. In two situations, dentists assigned a red code signifying severe dental anxiety, while both of those patients reported a yellow rating signifying mild anxiety. Dentists failed to correctly identify any of the patients who gave themselves a red code. Dentists assigned 74 patients green codes, which indicated minimal or low dental fear, while 23 (31.1%) of them had moderate fear and 4 (5.4%) experienced severe dread. In 63.5% of the instances, dentists correctly interpreted the green code. Participants who had an MDAS score of 19 stated that their dental dread increased at T1 and particularly at T2: 13.3% and 21.4%, respectively. The difference in the self-reported impact of COVID-19 on dental fear between T1 and T2 was statistically significant ( $P .002$ ). Participants with minimal or little dental anxiety stated that COVID-19 had no effect on them at T1 (95.1%) or T2 (87.5%), respectively. At T1, COVID-19 significantly reduced the likelihood that the most anxious people sought dental care compared to those who had less dental anxiety ( $P = .013$ ). At T1, 33.3% of people with an MDAS score under 19 stated that the pandemic had caused them to seek less dental treatment. Only 11.0% of participants reported decreased dental care seeking among those with no or little dental phobia. At T2, the pandemic no longer had an impact on seeking dental care in 82.6% of the cases, despite the MDAS score. Due to COVID-19, there was a statistically significant difference between T1 and T2 in the self-reported influence on obtaining dental care ( $P = .011$ ). If a patient selected the "Some other effect, what?" option in open commentary, he or she might share their thoughts on the impact of the COVID-19 circumstance on seeking dental care ( $n = 16$ ; 5.9%) or dental phobia ( $n = 5$ ; 1.8%). The majority of participants ( $n = 13$ ) complained about limited access to care. Additionally, those with an MDAS score under 24 ( $n = 4$ ) expressed concern about illnesses spreading in the waiting room.

## Discussion

Adult participants in this study displayed only moderate dental anxiety on average. The percentage of survey participants who had severe dental anxiety was comparable to that of the general adult population. 1,25 The MDAS questionnaire and two visual scales, as well as three separate dental fear assessments, were all utilised. To our knowledge, this is the first instance in which the "traffic light system" (CCF), which uses colours to represent three different levels of dental phobia, has been applied. The results of the participants' MDAS scores and colour codes were in perfect agreement; 9 out of 10 people who also reported having significant dental fear according to the MDAS chose the colour red, which denotes extreme dread. However, there was little agreement between the dentists' and participants' estimates, particularly for the people who were the most anxious. On the FIS scale, which is more frequently used to gauge children's dental phobia, adult participants tended to select the neutral response. Dental fear was more prevalent in people with MDAS scores below 19 at T1 and T2. The most anxious people claimed that the pandemic also affected how often they went to the dentist [11]. The number of participants was comparable between T1 and T2 when age and gender were taken into account. Previous research has shown that young male patients

are most likely to need emergency dental care. 26,27 The availability of dental care has been significantly impacted by the COVID-19 outbreak. 19 As a result, even the oldest residents and those with a regular pattern of dental care attendance may have been compelled to use urgent dental services at T1 and T2 more frequently than usual. Anxious dental patients were more reliably detected by older dental professionals and dentists than by younger ones, according to a recent study by Höglund et al. Possible differences in the experience, age, or special interests of the participating dentists could not be accounted for in analyses in this anonymous survey. This is a deficiency. Because dental hygienists and dental assistants are increasingly in charge of the first contact with patients, including other professions could have been advantageous. Adults who experience dental phobia or anxiety make up 5% to 15% of the population. 25 Patients who are afraid of the dentist are more likely to seek treatment only when there is a problem and infrequently 1,2,28, which may result in a greater requirement for emergency dental care. 27,29 When 4.9% to 16.7% of the study's participants fell into the category of patients who were the most anxious, depending on their gender or age, their dental anxiety levels were equivalent to those of the general population in this instance. This demonstrates that patients who had a high level of dental anxiety were not overrepresented. In other research, dental dread is reported by female patients and young patients more frequently than by male patients and older patients, 6,22,27,30 and these findings are consistent with our study. Digital access has been cited as a crucial step in the development of dental care. 31 On the other side, electronic forms may prevent those who are unfamiliar with using digital services and devices from using them. All survey participants found the manual completion of the surveys to be simple and speedy. As the MDAS form 11,12 and the FIS form 13 had already been validated, the employment of various validated forms as well as visual ones is advantageous in this situation. In the analysis, MDAS served as the reference (gold standard), and CCF was contrasted with it. Facial expression scales are good tools for measuring pain, and the FIS has been used in the past to assess dental phobia in children and adolescents 13. 32 This portion of the survey may have caused patients to misidentify it with the more common exit poll satisfaction smiling surveys used in health services. When participants tended to select the neutral choice, the FIS was unable to accurately identify dental fear in them. A visual survey form, such as "traffic lights," could be easier to complete and require less concentration in a hectic circumstance than a questionnaire. When used with Likert-style questions, colours may have an impact on the results. 33 According to our knowledge, this is the first place where visual colour codes (CCF) or "traffic lights" sans smileys have been used to screen for dental fear [12]. Red often indicates a stop signal, and traffic light-style colour coding is well-known and frequently utilised by both professionals and the general public in many different circumstances. The results of the self-reported MDAS scores and CCF agreed well, demonstrating that the colour codes could accurately identify those who were least and, particularly, most afraid. The dentists themselves expressed confidence in the CCF's ability to quickly and easily assess patients' levels of fear. Despite this, they underestimated the subjects' dental phobia. These results support a previous study by Höglund et al 3 that found dental clinicians fail to recognise the degree of their patients' dental anxiety. In dental practise, fear or anxiety questionnaires are not frequently employed. The COVID-19 virus had less of an impact than was anticipated, according to data from several research, which showed a significant impact on the need of emergency dental services. 19,36 The handful who were concerned about catching it in the waiting area all belonged to the group of those who had significant dental anxiety and who stated that COVID-19 made their anxiety worse. The findings

indicated some variations between the groups at T1 and T2, which might have been brought on by the ongoing COVID-19 pandemic.

## Conclusion

Patients that are afraid are difficult to identify in dental care. Patients' usage of "traffic light" colour codes, which can be utilised traditionally, as in this instance, and digitally, appears to be helpful for identifying dental anxiety.

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## Conflict of Interest

The authors declared no potential conflict of interest for the research, authorship, and/or publication of this article.

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