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# Minimizing the Vicious Circle of Pain–Anxiety–Avoidance: The Role of Positive Affect in Endodontic Therapy

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**Featured Application: Increasing positive affect in patients (atmosphere at the clinic, personalized treatment, relaxation, communication, among others) could contribute towards a reduction in the pain–anxiety–avoidance vicious circle, reducing treatment avoidance, and increasing patients' oral health.**

**Abstract:** Patients with a high level of anxiety anticipate extremely intense pain during dental treatment and frequently avoid visiting dentists, showing a tendency to become caught in a vicious circle of pain–anxiety–avoidance. This research aimed to examine whether dental anxiety mediates the impact of pain anticipation before endodontic treatment in the subjective avoidance of future treatments as a function of positive affect (moderating variable). One hundred consecutive patients that required endodontic therapy were enrolled in this study. In this prospective observational study, patients had to fill out a questionnaire twice: (a) first, prior to treatment (a baseline measurement including pain anticipation, MDAS (dental anxiety), PANAS (positive affect), ASA-PS (physical health), previous medication, an assessment form, and pulpal/periapical status); (b) second, once treatment had ended, the patients were registered for subjective avoidance and their number of canals of treated teeth. The results showed a significant correlation between pain anticipation, dental anxiety, and subjective avoidance; furthermore, the index of the association between pain anticipation and dental anxiety was diminished at higher levels of positive affect. In conclusion, there does not seem to be a direct and deterministic association between pain anticipation, dental anxiety, and subjective avoidance, but rather this relationship would depend on the possible influence of the personality variables of the patients.

**Keywords:** root canal treatment; pain anticipation; dental anxiety; subjective avoidance; positive affect; previous medication



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## 1. Introduction

Periodic dental visits are indispensable to promoting adequate oral health among the general population [1]. The Spanish Dental Council recommends a dental check-up at least once a year and, in the case of adults diagnosed with any oral disease, every six months [2]. Nevertheless, more than 60% of the Spanish population did not visit dentists in 2021, making it one of the countries with the highest dental appointment avoidance rates in the EU [3]. The reasons why people do not regularly visit dentists are complex, as several different variables should be taken into account. One barrier that has been extensively studied is dental anxiety [4,5]. Dental anxiety is a worldwide problem and is reported by one in six adults [6]. In 1984, Berggren [7] described dental anxiety with patient avoidance behavior, resulting in a deterioration in oral health. In addition, it is known that within the dental context, anxiety has a reciprocal relationship with pain [8,9]. Anxious people have a tendency to overestimate pain during treatment, and this anticipation of pain causes further anxiety [10,11]. Patients matching this pattern run the risk of entering into a spiral

(i.e., vicious circle) because they avoid dental treatment due to overestimated pain [9,12]. Particularly, endodontic therapy is one of the dental treatments that causes the highest anxiety and pain overestimation in patients [13]. Additionally, previous studies highlighted the fact that the incidence of pain increased as the pulpal histopathosis worsened [14]. Patients who reported dental pain often already had a history of pain in the same tooth [14]. Having suffered repeated pain can make them more anxious when they attend the dentist. In general, patients who need root canal treatment are in this vicious circle due to years of missing regular dental check-ups or avoiding preventive treatment [15–17].

Thus, the vicious circle of pain–anxiety–avoidance should be faced by governments because it harmfully affects oral health and represents a failure in preventive treatments. In order to gain knowledge of this complex relationship, biopsychosocial approaches constitute effective instruments that can progress deeper into patients' personality traits that could be affecting this vicious circle [18,19]. In this context, this study aimed to examine whether dental anxiety (mediating variable) mediates the effect of pain anticipation before endodontic treatment (independent variable) on the subjective avoidance of future treatments (assessed at the end of endodontic therapy) (dependent variable) as the function of a positive affect (moderating variable). We hypothesized that positive affect (moderator) operates on dental anxiety, which is statistically reflected by an interaction between dental anxiety and positive affect. Figure 1 illustrates the hypothesized process.

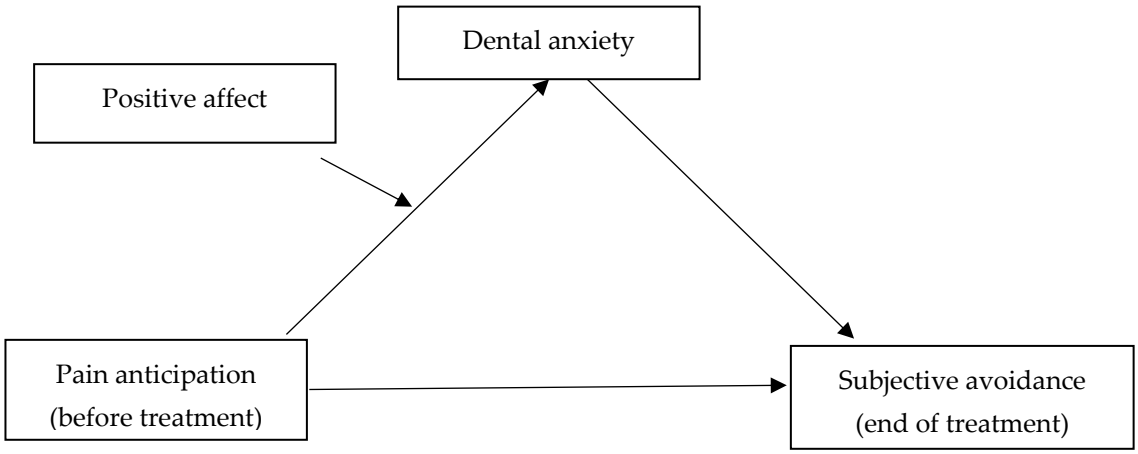


**Figure 1.** Proposed model of moderated mediation.

In order to achieve this goal, three steps were carried out, examining (1) whether anticipation of pain before endodontic treatment affected subjective avoidance through dental anxiety (i.e., dental anxiety as mediator), (2) whether the effect of the pain anticipation on dental anxiety depended on the level of positive affect and how this effect influenced the mediation (whether the mediation is moderated by positive affect), and (3) whether this moderated mediation was maintained after controlling for the possible influence of different endodontic variables (only those with statistically significant relationships with the variables under study). To the best of our knowledge, there are no previous studies that have analyzed this issue.

## 2. Materials and Methods

### *2.1. Sample*

The present research obtained the approval of the Ethics Committee of Rey Juan Carlos University (protocol code 26/2014 and date of approval 21 October 2014). This prospective observational study was carried out in two different dental practices: at the Rey Juan Carlos University (Madrid, Spain) and in a private clinical setting (Madrid, Spain). The choice of conducting this research in two different clinics was to obtain a sample that would accurately reflect the Spanish population undergoing this type of treatment. A total of one

hundred consecutive patients were enrolled in the study, 59 of them were treated at the Endodontic and Restorative Department (School of Medical Science) of Rey Juan Carlos University (Madrid, Spain), and 41 endodontic treatments were conducted at Ferrus and Bratos Dental Practice, Madrid, Spain. A previous study with similar characteristics served as the basis for the sample size calculation [16]. The present research began in February 2014 and ended in March 2019. Consecutive patients that had a need for non-surgical endodontic therapy who were referred to an endodontist service were asked to participate in the present study. All patients in this study were given written information about the investigation; furthermore, written consent was obtained from all patients before starting the therapy. The inclusion criteria were to require non-surgical endodontic therapy and to be over 18 years of age. The exclusion criteria were a severe mental disorder diagnosis or not signing any informed consent forms. Patients with other dental problems other than root canal treatment were excluded in order to standardize the research and determine the behavior of the variables under study in a single dental treatment.

### 2.2. Procedure

Only one single endodontist with eight years of experience in the conservative dentistry field carried out all the treatments (MSc Endodontics and Operative dentistry), following the guidance of the European Society of Endodontology [20]. Once the patient was anesthetized, a rubber dam was placed on the treated tooth. A high-speed diamond bur size 014 (Komet®, Lemgo, Germany) was used to prepare and access the cavity and, for the preparation of canals, k-files (Denstply Maillefer®, Baillagues, Switzerland) and rotatory files (ProTaper Universal files, Denstply Maillefer®, Baillagues, Switzerland) were utilized. During canal shaping, 5.25% sodium hypochlorite was used between the files, and a final rinse of 18% EDTA (Ultradent®, St. Louis, MO, USA) was performed. To conclude, paper points were used to dry the canals and were sealed employing AH Plus (Denstply Sirona®, Baillagues, Switzerland) and a continuous wave down pack technique with gutta-percha (System B, SybronEndo®, Glendora, CA, USA). After root canal therapy, each patient was scheduled for a second appointment to reconstruct the crown of the tooth and return it to full functioning.

### 2.3. Measures

Data were collected at two time points (a) a first-time point before beginning endodontic therapy while waiting to be attended (baseline measurements); and (b) a second-time point after finalizing the treatment.

(a) Baseline measurements

i. Psychological variables:

- Pain Anticipation: The question ad hoc: 'How you feel the pain will be during treatment?' was used to evaluate pain anticipation. This item presented a 10-point Likert-type response scale, ranging from '0 = no pain' to '10 = maximum pain'.
- Dental anxiety: The Modified Dental Anxiety Scale (MDAS) in its Spanish validation was used [21]. It is a short and commonly used tool. The MDAS was developed to improve the psychometric characteristics of the previous Dental Anxiety Scale (DAS) [22,23]. It contains 5 items related to dental experiences, with a 5-point Likert (from "not anxious" to "extremely anxious") scale, obtaining a total score range from 5 to 25. A person is classified as 'very dentally anxious' with a score of 19 or higher. In previous studies, Cronbach's alpha was 0.88 [24]. In our sample, a Cronbach's alpha of 0.86 was found.
- Positive Affect: The Positive and Negative Affect Scale (PANAS) in its Spanish version was used [25]. Specifically, the positive affect subscale was used to measure positive affect. The PANAS was developed by Watson et al. [26] and was adapted and validated in Spanish by Sandin et al. [27]. It is made up of two independent scales that allow the measurement of positive affect

and negative affect. Each of the scales consists of 10 items with a Likert-type response format of 5 points, ranging from '1 = not at all' to '5 = extremely'. Specifically, a positive affect is defined as the degree to which people have a tendency to experience positive emotions and engage in a pleasurable way with their environment. Previous research has revealed an exceptional internal consistency (0.90) [28]. Cronbach's alpha value was 0.85 in our sample.

ii. Clinical variables:

- American Society of Anaesthesiologist's Physical Status Classification System (ASA-PS) [29]: The ASA-PS was used to categorize the physical health of patients. This classification is a widely graded system used in healthcare-related environments. The rating is composed of six types (I to VI). In this research, only class I (healthy patients), class II (mild systemic disease patients), and class III (severe systemic disease patients) were used. The ASA-PS has been widely used in healthcare fields; however, it should be noted that it has a low inter-rater reliability with a profound dependency on the clinician's experience [30].
- Medication: This variable included whether the patients had taken medication (or not) for their current dental trouble before starting endodontic treatment. Previous medication became dichotomous variable scores were either 0 (patient hadn't been taking medication) or 1 (patient had been taking medication). In addition, among the patients who had been taking medication, we registered the type of medication with an item on a response scale '1 = anti-inflammatory drugs', '2 = antibiotics', and '3 = antibiotics and anti-inflammatory drugs'.
- The Endodontic Case Difficulty Assessment Form was developed by The American Association of Endodontics (AAE) [31]. The endodontist had to complete this form to identify three influential issues in the treatment: the patient's considerations, diagnosis and treatment considerations, and additional considerations. For each of these categories, degrees of difficulty of treatment (minimal, moderate, and high) were distributed based on risk factors. The sample was distributed as '1 (minimal difficulty) = a case with any complicating factor', '2 (moderate difficulty) = a case with one or more complicating factors', '3 (high difficulty) = exhibiting multiple factors in the "moderate difficulty" category'.
- Pulpal status: Palpation tests, percussion tests, and thermal sensibility tests were used to diagnose pulpal status. The patients were distributed in the following categories: irreversible pulpitis, necrosis, apical periodontitis, and the need for retreatment. Further, in order to assess whether the tooth to be treated showed a radiolucent injury in the bone, preoperative periapical radiography was performed. This was recorded as a dichotomous variable, which was either 1 (the tooth showed a radiolucent apical lesion) or 2 (the tooth did not show a radiolucent apical lesion).

(b) End of treatment

i. Psychological variables:

- Subjective Avoidance: This behavioral indicator was registered using an ad hoc item. One week after Endodontic Therapy was finished, the patients were asked to evaluate the level of avoidance they remembered during treatment, answering: 'To what extent would you still avoid having root canal treatment?'. A 10-point Likert response format was used for this item (ranging from '0 = no avoidance' to '10 = maximum avoidance').

ii. Clinical variables:

- Number of canals of treated teeth: This was registered as '1 = if the tooth had one canal to be treated', '2 = if the tooth had two canals to be treated', and successively.

### 2.4. Data Analysis

The corresponding descriptive analyses were performed for the variables of interest first. Cronbach's alpha values were calculated for the variables under study. The corresponding Pearson correlation analyses were also carried out. To study the possible covariates, Student's *t*-test, and one-way ANOVAs were carried out with the corresponding post hoc analyses (Sheffé). Second, in relation to the objective of the study, a moderated mediation analysis was carried out. The moderated mediation analyses allowed us to combine, within a single model, both mediation and moderation effects [32]. For this purpose, PROCESS was used, and a modeling tool was designed for this type of analysis. PROCESS has demonstrated a higher reliability of results which is an advantage over other methods of mediation and moderation analysis [32]. Bias-corrected 95% confidence intervals were applied based on 5000 bootstrapped samples for analyses. In the case of mediation, an indirect effect was considered significant if the zero value was not included in the confidence interval. Model 7 was used for moderated mediation. Specifically, the model states that the path from "anticipation of pain" to "subjective avoidance" is mediated by dental anxiety, and in turn, the path "anticipation of pain" to "dental anxiety" is moderated by a positive affect. A bootstrapping procedure (5000 bootstrap samples) was used to estimate the conditional indirect effects [33]. The moderation approach implies that the indirect effect index (mediator: dental anxiety) can vary when considering different moderator levels (positive affect).

## 3. Results

The patients' mean age was 42.91 years old (SD = 11.9; range 18–72). A total of 60% were women. No patient who was asked to participate in the research declined the invitation. Only 26% of the patients had not undergone a previous root canal treatment. The type of tooth treated was as follows: 46 molars, 29 premolars, 7 canines, and 17 incisors. Retreatment was diagnosed for 31% of the patients, and 68 % attended due to primary endodontic treatment.

### 3.1. Descriptive Analyses and Study of Covariates

Table 1 shows the statistically significant positive correlations between pain anticipation, dental anxiety, and subjective avoidance (all $p < 0.001$). The largest effect size was observed in the case of the correlation between pain anticipation and dental anxiety, followed by subjective avoidance and dental anxiety. Significant negative correlations were also found between dental anxiety and positive affect ($p = 0.004$) and between pain anticipation and positive affect ($p = 0.011$).

**Table 1.** Mean, standard deviation and correlation between outcome variables.

| | Mean (SD) | 2 | 3 | 4 |
|---|---|---|---|---|
| 1. Pain anticipation | 4.11 (2.40) | 0.581 ** | 0.386 ** | −0.253 * |
| 2. Dental anxiety | 10.29 (4.79) | | 0.411 ** | −0.284 ** |
| 3. Subjective avoidance | 4.75 (3.53) | | | −0.065 |
| 4. Positive affect | 35.72 (5.09) | | | |

* $p < 0.05$, ** $p < 0.01$.

Regarding the possible covariates considered (previous medication, radiolucent apical lesion, ASA-PS Classification, number of canals, pulpal diagnosis, AAE Endodontic Case Difficulty Assessment Form), significant associations were only observed in the case of medication prior to treatment and pain anticipation. Specifically, the fact that patients were (or were not) taking medication prior to starting root canal treatment maintained significant

associations with pain anticipation and was closely related to significance with dental anxiety ($p = 0.007$). Specifically, patients who took prior medication had significantly higher pain anticipation scores (Mean = 5.28, SD = 2.08) than those who were not taking prior medication (Mean = 3.63, SD = 2.38), ($t = -3.401$, $p = 0.001$, partial eta squared = 0.096).

### *3.2. The Moderation Mediation Model of Pain Anticipation on Subjective Avoidance by Dental Anxiety, at Different Levels of Positive Affect*

#### 3.2.1. Previous Analysis: Mediation Role of Dental Anxiety between Pain Anticipation and Subjective Avoidance

Conforming to the purpose of this research, the mediation role of dental anxiety between pain anticipation and subjective avoidance was analyzed, controlling for medication prior to endodontic treatment (covariate). The findings show that dental anxiety significantly mediated the association between pain anticipation and subjective avoidance (bootstrap CI greater than zero) when controlling for previous medication. The model shows a significant total effect (c = 0.570, $t = 3.93$, $p < 0.01$, [95% CI = 0.283/0.858]). The direct effects of pain anticipation on dental anxiety were observed (ß = 1.16, SE = 0.17; $t = 6.69$, $p < 0.001$, [95% CI = 0.822/1.516]); as well as effects in dental anxiety on subjective avoidance (ß = 0.206, SE = 0.08; $t = 2.506$, $p = 0.013$; [95% CI = 0.042/0.370]). The direct effect of pain anticipation on subjective avoidance was close to significance (c = 0.329, $t = 1.92$, $p = 0.057$, [95% CI = −0.010/0.668]). The overall model allowed the explanation of a 20% (F = 7.99; $p < 0.0001$) variance in subjective avoidance.

#### 3.2.2. The Moderation Mediation Model of Pain Anticipation on Subjective Avoidance by Dental Anxiety at Different Levels of Positive Affect

Based on previous results, the indirect effect of pain anticipation on subjective avoidance was examined through dental anxiety as a function of the levels of positive affect. Previous medication was included as a covariate. The results show that the effect of pain anticipation on dental anxiety depends on the levels of positive affect after including the effect of covariates (i.e., previous medication). Although in the three levels of positive affect, the relationship was statistically significant, it decreased when the positive affect was greater. Thus, the following indicators were observed at low levels (B = 1.42; SE = 0.24; $t = 5.89$, $p < 0.001$; [95%CI = 0.945/1.91]), medium levels (B = 1.04; SE = 0.18; $t = 5.82$, $p < 0.001$, [95%CI = 0.609/1.40]) and high (B = 0.67; SE = 0.26; $t = 2.58$; $p = 0.011$; [95%CI = 0.154/1.18]). The moderated mediation index for subjective avoidance was calculated through Hayes' algorithm. This procedure yielded an estimate of ß= −0.02 [95% CI = −0.04/0.002]. Table 2 and Figure 2 show these results, pointing out that the value of the connection between pain anticipation and dental anxiety was diminished when PA was higher. In the model as a whole, the indirect effect of pain anticipation on subjective avoidance via dental anxiety was higher in patients with lower PA.

**Table 2.** Moderate mediation model.

| **Moderation of Positive Affect on Dental Anxiety** | | | | |
|---|---|---|---|---|
| **VD: Dental Anxiety** | **B (SE)** | ***t*** | ***p*** | **[LLCI-ULCI]** |
| VI: Pain anticipation (Pain) | 1.05 (0.179) | 5.88 | <0.001 | [0.70/1.41] |
| M: Positive affect (PA) | −0.17 (0.08) | −1.97 | 0.051 | [−0.33/<0.001] |
| Pain × PA (interaction) | −0.08 (0.03) | −2.17 | 0.032 | [−0.14/−0.006] |
| * previous medication (covariate) | 0.48 (0.94) | 0.512 | 0.609 | [−1.38/2.34] |
| Conditional effects of the predictor (i.e., pain anticipation) at different values of the moderator (PA) | | | | |

**Table 2.** *Cont.*

| **Moderation of Positive Affect on Dental Anxiety** | | | | |
|---|---|---|---|---|
| **VD: Dental Anxiety** | **B (SE)** | ***t*** | ***p*** | **[LLCI-ULCI]** |
| −4.87 | 1.42 (0.24) | 5.89 | <0.001 | [0.945/1.91] |
| 0.13 | 1.04 (0.18) | 5.82 | <0.001 | [0.609/1.40] |
| 5.13 | 0.67 (0.26) | 2.58 | 0.011 | [0.154/1.18] |
| Regression of pain anticipation on subjective avoidance through dental anxiety | | | | |
| VD: Subjective avoidance | B (SE) | *t* | *p* | [LLCI-ULCI] |
| VI: Pain anticipation | 0.33 (0.17) | 1.92 | 0.057 | [−0.01/0.67] |
| Me: Dental anxiety | 0.21 (0.08) | 2.50 | 0.013 | [0.04/0.37] |
| * previous medication (covariate) | −0.09 (0.75) | −0.12 | 0.907 | [−1.58/1.40] |
| Model summary | $R^2$: 0.21 | $p < 0.001$ | | |
| Indirect effects at values * of PA | | | | |
| −4.87 | 0.29 (0.12) | | | [0.05/0.55] |
| 0.13 | 0.21 (0.09) | | | [0.04/0.42] |
| 5.13 | 0.13 (0.09) | | | [<0.001/0.36] |
| Indexes of moderated mediation | −0.02 (0.01) | | | [−0.04/0.002] |
| Effect 1 minus Effect 2. Conditional indirect effects contrast | | | | |
| | Effect 1 | Effect 2 | contrast | [LLCI/ULCI] |
| | 0.216 | 0.294 | −0.078 | [−0.189/0.008] |
| | 0.138 | 0.294 | −0.156 | [−0.379/0.016] |
| | 0.138 | 0.216 | −0.078 | [−0.189/0.008] |

All continuous variables were centred. Abbreviations: BootLLCI, bootstrapping lower limit confidence interval; BootULCI, bootstrapping upper limit confidence interval; SE, standard error. Model 7 from Process, * covariate.

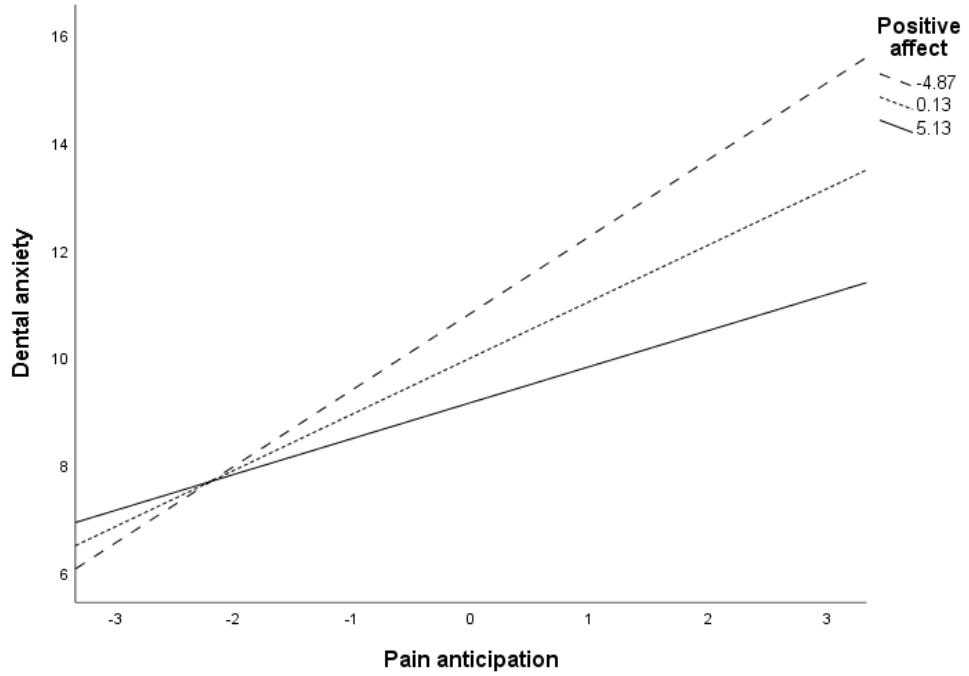


**Figure 2.** Pain anticipation on dental anxiety at different levels of positive affect.

## 4. Discussion

This prospective study investigated whether dental anxiety mediated the effect of pain anticipation (before endodontic treatment) on the subjective avoidance of future dental treatments as a function of positive affect. Our results show a significant relationship between pain anticipation, dental anxiety, and subjective avoidance. These results are in accordance with the vicious circle model [34]. Due to the close associations between pain anticipation and dental anxiety found in previous studies, different authors, in the context of dental health, have used fear of dental pain constructs, which emerge as a concept that attempts to explain complex interactions between anxiety and pain [9]. A differential aspect of the current study is that subjective avoidance was measured separately from other variables associated with dental health, such as dental fear. In the study by Nermo et al. [11], patient avoidance was registered, requesting if patients had delayed any dental appointments because of fear. In our opinion, it is important to study differential behavioral variables to understand the influence they have on the separate time points of dental treatment.

Regarding the medical variables registered in the present study, another result was that only prior medication held a significant association with the variables that made up the pain–anxiety–avoidance vicious circle. This result is in accordance with previous research that has shown that people with a high level of anxiety look for dental care solely when they are in pain [35].

One of the most novel aspects of the present study is that it introduces the possible influence of personality variables in patients within the pain–anxiety–avoidance vicious circle. The results of the present study demonstrated that the value of the association between anticipation of pain and dental anxiety was diminished at higher levels of positive affect. In this way, the indirect effect of pain anticipation on subjective avoidance via dental anxiety was higher in patients with a lower positive affect. Therefore, there does not seem to be a direct and deterministic association between pain anticipation, dental anxiety, and subjective avoidance, which contradicts what previous studies have shown [9,17]. Over the past few years, certain psychological flexibility models within the Acceptance and Commitment Theory (ACT) have supported this type of result [36,37]. What this model proposes is that as opposed to a linear and clearly determined relationship between variables, what actually occurs is that associations are much more complex and depend on interactions with moderating and mediating variables, such as situational, contextual, and personality factors [38,39]. In dentistry, the Acceptance and Commitment Theory has scarcely been studied. As far as we know, only Werner et al. [40] used ACT as a theoretical framework to promote behavioral changes in young adult patients with dental caries. Their study focused on the prevention of dental caries, acting upon bad habits such as sugar consumption as well as upon hygiene techniques and regular dental visits. This type of preventive strategy allows for more conservative and minimally invasive dental treatment of patients. Their suggestion, by means of the ACT, allows for individual risk prevention of oral diseases due to certain risk factors [39,41–43].

In the current study, a precise personality factor (positive affect) has been shown to establish differences between the relationship between anticipation of pain and dental anxiety and the whole pain–anxiety–avoidance vicious circle. These results could be discussed within the area of personalized treatments. Therefore, in this case, the association between pain anticipation and dental anxiety is personalized based on each patient and is closely associated with personal traits, specifically positive affect. In this context, the role of personal traits has become increasingly recognized as an important factor in the humanization of treatments [44,45], which from our point of view, has scarcely been explored in dental treatments, particularly in root canal treatments.

Another aspect of this study that should be highlighted is that it is a positive personality trait that is the variable moderating the vicious circle of pain anticipation, dental anxiety, and avoidance. Positive affect is a trait that reflects stable individual differences in positive emotional experiences and has been defined and associated with favorable

health outcomes [46]. In dentistry, the vast majority of previous researchers have focused on the influence of negative variables such as neuroticism [47] or loneliness [48]. To our knowledge, no previous research has focused on analyzing the influence of positive personality traits on root canal treatments. Future research should explore the influence of another affective, including positive and dispositional variables in dental treatments. This suggestion is in line with the benefits of applying positive psychology to odontology, as health is not viewed in a single sense (whatever excludes illness); what it does is include the study of positive individual traits so that patients can improve their quality of life, motivating them and increasing their abilities regarding certain treatments [49].

Several limitations to the present research warrant mention. First, the sample size was small and was collected at two different sites, which could imply a bias in relation to the patient's profile, as there may be differences between those who attend university clinics versus those who choose to attend a private dental clinic. For this reason, the generalization of results should be made with some caution.

In spite of the above-mentioned limitations, the results obtained have important practical implications regarding the study of the anticipation of pain through dental anxiety, as this could help to create patient profiles and identify those at high risk of avoidance. The results of the present study point out the need to take into consideration a patient's anticipation of pain during endodontic therapy. Analyzing this variable allows the creation of patient profiles to identify those who are likely to avoid a future root canal treatment independently of the pain they experience during treatment. Furthermore, the model shows that dental anxiety is a mediator variable between pain anticipation and avoidance. From the perspective of the patient as an active agent [44,45], patients' personalities, specifically positivity, could be seen as a moderator in the association between pain anticipation and dental anxiety, softening the association and contributing to a lower avoidance rate. Patients with higher positive affect, even when facing the same anticipation of pain, do not experience the same amount of dental anxiety; therefore, a direct and universal relationship between pain anticipation and dental anxiety needs to be established.

Reducing the rates of avoidance in dental appointments with regular visits could allow for a clinical approach based on prevention, thereby improving the quality of care and minimizing the costs of treatment while, in turn, reducing a public health problem [5,50,51]. Because of this, the improvement of positive affect should become an explicit aim within root canal treatment due to its effects on avoidance. To accomplish this aim, some strategies that should be taken into consideration are in relation to the atmosphere of the dental clinic, attentive listening, empathy towards the patient, the use of kind language, offering breaks during treatment, assuring the patient that treatment will not be started until complete analgesia has been achieved, relaxation techniques, and personalized treatments (including psychological needs). All these recommendations should be known by clinical staff. In this sense, the previous literature has shown the efficacy of different strategies on the reduction of dental anxiety, including the use of music [52], hypnosis [52], or the control of environmental factors such as the waiting area or ensuring that patients are not exposed to certain sounds such as drills [53].

## 5. Conclusions

The findings of this research highlight the complexity of the anxiety–pain–avoidance vicious circle and, especially, the relevance of certain personality traits in reducing its negative effects. We would, therefore, like to highlight the role of the patient as an agent of their own health. Far from a universal and deterministic association between anxiety, pain, and avoidance, certain positive personality traits (i.e., positive affect) can soften this association. This result suggests that a modification of the way dentistry is taught in dental schools focusing on the positive psychology of dentistry is needed. Integral treatments based on a biopsychosocial perspective of root canals should include the above-mentioned strategies so as to increase positive affect and, in turn, contribute to improved oral health by means of a reduction in avoidance.

**Author Contributions:** N.S.-P. contributed to the conceptualization and design of the study, acquisition of the data and writing of the original draft. C.P.-P. contributed to analysis and interpretation of data and review and editing the manuscript. All authors have read and agreed to the published version of the manuscript.

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**Institutional Review Board Statement:** This study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of Universidad Rey Juan Carlos (protocol code 26/2014 and date of approval 21/10/2014).

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study. Written informed consent was obtained from the patients to publish this paper.

**Data Availability Statement:** The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy restrictions.

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**Conflicts of Interest:** The authors declare no conflict of interest.

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