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Effects of expectancy and empathy communication strategies on patient-reported outcomes and experiences during periodontal examination: a pilot randomized clinical trial

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Original Article

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Efeitos de estratégias de comunicação baseadas em expectativa e empatia sobre os desfechos e as experiências relatados pelos pacientes durante o exame periodontal: um estudo clínico randomizado piloto

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Resumo

Objetivo: Este estudo teve como objetivo avaliar os efeitos individuais e combinados da manipulação da expectativa e da manipulação da empatia sobre os desfechos relatados pelos pacientes (*patient-reported outcome measures* – PROMs) e as experiências relatadas pelos pacientes (*patient-reported experience measures* – PREMs) em adultos submetidos a um exame clínico periodontal. **Material e método:** Os participantes foram randomizados em quatro grupos: (i) Controle – atendimento padrão; (ii) Manipulação da expectativa; (iii) Manipulação da empatia; e (iv) Manipulação combinada da expectativa e da empatia. Os desfechos avaliados incluíram percepção e expectativa de dor, ansiedade, humor, empatia e satisfação, mensurados por instrumentos validados, como o *State-Trait Anxiety Inventory* (STAI-estado), a *Positive and Negative Affect Schedule* (PANAS), o CQ-index e o *Interpersonal Reactivity Index* (IRI). **Resultado:** Foram incluídos 24 pacientes, sendo a maioria do sexo feminino, sem diferenças significativas entre os grupos quanto à idade ou ao sexo. Todos os participantes apresentavam saúde periodontal. A manipulação da empatia reduziu o medo do exame clínico periodontal ($p = 0,034$) e aumentou a satisfação dos pacientes. Entretanto, os participantes expostos simultaneamente à manipulação da expectativa e da empatia relataram maior percepção de dor durante/após o exame clínico. De modo geral, a comunicação aprimorada pela empatia demonstrou benefícios clinicamente relevantes, incluindo redução do medo,

aumento da satisfação e maior engajamento nos cuidados periodontais. A manipulação isolada da expectativa pareceu estimular maior interesse dos pacientes pelo exame clínico periodontal, mas também esteve associada a maior antecipação da dor. **Conclusão:** Nossos resultados sugerem que a manipulação da empatia exerceu um potencial efeito semelhante ao placebo, reduzindo o medo, superando objeções, aumentando o interesse e a participação ativa dos pacientes no cuidado, além de melhorar a satisfação com o exame clínico periodontal.

Descritores: Doença periodontal; medidas de experiência relatadas pelos pacientes (PREMs); medidas de desfechos relatados pelos pacientes (PROMs); periodontite; exame periodontal.

Abstract

Objective: This study aimed to evaluate the individual and combined effects of expectation manipulation and empathy manipulation on patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs) in adults undergoing a periodontal clinical examination. **Material and method:** Participants were randomized into four groups: (i) Control – standard care; (ii) Expectation manipulation; (iii) Empathy manipulation; and (iv) Combined expectation and empathy manipulation. Outcomes included pain perception and pain expectation, anxiety, mood, empathy, and satisfaction, assessed using validated instruments such as the State-Trait Anxiety Inventory (STAI-state), Positive and Negative Affect Schedule (PANAS), CQ-index, and Interpersonal Reactivity Index (IRI). **Result:** A total of 24 patients were included, the majority being women, with no significant differences in age or sex across groups. All participants were diagnosed with periodontal health. Empathy manipulation reduced fear of the periodontal clinical examination ($p = 0.034$) and increased patient satisfaction. However, participants exposed to both expectation and empathy manipulation reported higher pain perception during/after the clinical examination. Overall, empathy-enhanced communication demonstrated clinically

benefits, including reduced fear, improved satisfaction, and increased engagement in periodontal care. Expectation manipulation alone appeared to stimulate greater patient interest in the clinical examination but was also associated with heightened anticipation of pain. **Conclusion:** Our findings suggest that empathy manipulation exerted a potential placebo-like effect, reducing fear, overcoming objections, increasing patient interest and active participation in care, and improving satisfaction with the periodontal clinical examination.

Descriptors: Periodontal disease, patient-reported experience measures; patient reported outcome measures; periodontitis; periodontal examination.

INTRODUCTION

Periodontal clinical examination is an essential component of the diagnosis, prevention, and management of periodontal diseases. However, procedures such as periodontal probing may provoke fear, anxiety, and pain, even in individuals with periodontal health. These negative experiences may reduce patient acceptance of periodontal examinations, compromise adherence to preventive and therapeutic care, and negatively affect the overall dental experience. Identifying simple, non-pharmacological strategies capable of improving patient comfort and reducing procedure-related fear therefore represents an important clinical objective.

Among the factors that influence patients' experiences during healthcare, provider–patient communication has emerged as a potentially important therapeutic tool. Effective communication strengthens trust, improves treatment adherence, and enhances patient satisfaction. Nevertheless, communication is still frequently regarded as a subjective interpersonal skill rather than an intervention capable of producing measurable clinical effects. Recent evidence suggests that communication itself may influence patients'

perceptions, emotions, and responses to treatment through placebo-related mechanisms mediated by verbal and non-verbal interactions.¹⁻⁵

One communication strategy that has received considerable attention is expectancy manipulation. Expectancy manipulation refers to intentionally shaping patients' expectations regarding an upcoming procedure or treatment through verbal information. By emphasizing positive aspects of a procedure, such as its safety, effectiveness, or minimal discomfort, clinicians may modify patients' cognitive expectations, which can subsequently influence pain perception, anxiety, and treatment outcomes. Experimental studies have demonstrated that positive verbal suggestions can enhance the perceived effectiveness of active treatments and contribute to the beneficial effects observed with open-label placebos²⁻⁸.

A second communication strategy is empathy manipulation, which differs fundamentally from expectancy manipulation. Rather than changing what patients expect, empathy manipulation aims to improve how patients feel during the clinical encounter. It involves communicating genuine empathy through active listening, validation of patients' concerns, reassurance, supportive verbal statements, appropriate eye contact, and other empathic verbal and non-verbal behaviors. These interactions may reduce emotional distress, increase trust, and promote placebo-like responses independently of cognitive expectations. Although several studies suggest that empathic communication improves patient-reported outcomes, relatively few investigations have directly evaluated this mechanism, and its effects remain less well understood than those of expectancy manipulation^{6,7,9-11}. Furthermore, the independent and combined effects of expectancy and empathy manipulation have rarely been investigated within the same clinical study.

Despite increasing evidence supporting communication-based placebo mechanisms, these approaches have seldom been incorporated into routine dental practice. Communication is frequently viewed as an inherent professional attribute rather than a therapeutic intervention that can be standardized, evaluated,

and optimized. Consequently, the verbal, relational, and psychological components of patient care remain underutilized despite their potential to improve patients' clinical experiences^{1,9}.

These issues are particularly relevant in periodontology, where successful care depends not only on accurate diagnosis but also on long-term patient participation and adherence to preventive and therapeutic recommendations. Recent European Federation of Periodontology (EFP) S3 clinical practice guidelines for the treatment of stages I–III¹² and stage IV¹³ periodontitis have emphasized the importance of incorporating patient-reported outcome measures (PROMs) into periodontal care. Communication strategies that reduce fear, alleviate discomfort, improve satisfaction, and encourage acceptance of periodontal examination may therefore facilitate patient engagement from the earliest stages of diagnosis and contribute to greater adherence throughout periodontal treatment.

The present pilot randomized clinical trial evaluated the individual and combined effects of expectancy manipulation and empathy manipulation on patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs) in adults undergoing a periodontal clinical examination. By investigating these communication strategies in a real clinical setting, this study sought to determine whether enhanced provider–patient communication can improve patients' experiences during periodontal examination and provide a foundation for communication-based interventions in periodontal practice.

MATERIAL AND METHOD

Study design

This randomized, controlled, parallel-arm clinical trial followed a two-by-two factorial design, resulting in four comparison arms. The trial was designed to investigate whether manipulating patients' expectations and the expression of empathy during a periodontal clinical examination could improve PROMs. The study protocol was reviewed and approved by the Research Ethics Committee (protocol number: 7.278.969, CAAE: 83405224.5.0000.5569) and conducted in accordance with the Declaration of Helsinki

(1964) and its subsequent revisions, most recently in 2013. All participants provided written informed consent prior to inclusion, following the requirements of Brazilian National Health Council Resolution 466/2012. This trial adhered to the CONSORT 2025 reporting guidelines¹⁴.

Participants

Participants were recruited from the Pernambuco Faculty of Health in Brazil. Eligible participants were adults aged 18 to 65 years with at least 20 natural teeth and classified as ASA I or II according to the American Society of Anesthesiologists, indicating no complex systemic comorbidities. Additional inclusion criteria required that patients be able to hear, speak, and understand Portuguese.

Exclusion criteria were defined to minimize potential confounding factors. Patients were excluded if they had prediabetes, type 1 or type 2 diabetes, a history of cognitive decline, dementia, or chronic pain, or if they had previously undergone a periodontal examination. Other exclusion criteria included receiving periodontal treatment in the preceding six months, use of anti-inflammatory drugs or antibiotics within the last three months, and use of medications known to induce plaque-related gingival hyperplasia. Individuals requiring antibiotic prophylaxis prior to periodontal examination were also excluded. Data from participants who withdrew were retained in the analysis up to the point of exclusion, unless participants explicitly declined this option.

Randomization and study groups

A total of 24 participants were enrolled and randomly allocated into four equal groups ($n = 6$ per group) (Figure 1). The groups included: (i) a control group (CTL), which underwent the periodontal examination under standard care conditions without expectancy or empathy manipulation; (ii) Expectancy

manipulation group (EXP); (iii) Empathy manipulation group (EMP); and (iv) Combined expectancy and empathy manipulation group (EXP+EMP).

Randomization was performed using a computer-generated block randomization sequence with balanced allocation generated in Jamovi software (<https://www.jamovi.org>). The randomization sequence was prepared by a researcher not involved in participant recruitment, intervention delivery, clinical examination, or outcome assessment (D.S.B.). Allocation concealment was ensured using sequentially numbered, opaque, sealed envelopes prepared before participant enrollment. After participant inclusion, envelopes were opened immediately prior to the intervention by the researcher responsible for communication delivery. Because this study was designed as a pilot randomized clinical trial, a formal a priori sample size calculation was not performed. The sample size was determined based on feasibility and the exploratory nature of the investigation. The primary purpose of this pilot study was to obtain preliminary estimates of effect size, evaluate feasibility, and generate methodological data to support future adequately powered randomized clinical trials.

Intervention protocols

All communication interventions and periodontal examinations were performed by a single trained operator (P.E.B.S.G.) to ensure consistency and standardization throughout the study. Prior to participant enrollment, the operator underwent calibration and training sessions supervised by the senior investigator (D.S.B.), focusing on the standardization of verbal and non-verbal communication strategies used in both expectancy and empathy manipulation protocols. These training sessions included simulated patient interactions and predefined scripts to minimize variability in communication delivery among participants. Expectancy manipulation consisted of providing participants with standardized verbal information designed to positively influence expectations regarding the periodontal clinical examination. A predefined

communication script was used for all participants allocated to the expectancy groups. Patients were informed that the examination was important for detecting periodontal conditions such as gingivitis and periodontitis, that the procedure typically lasted approximately 15–20 minutes, and that it was generally painless, did not require anesthesia, and would be immediately followed by communication of findings and treatment planning. Participants were also asked whether they were familiar with the periodontal examination, and emphasis was placed on the importance of periodontal health for both oral and systemic well-being.

Empathy manipulation involved standardized verbal and non-verbal communication strategies aimed at creating a supportive, reassuring, and patient-centered environment. To ensure consistency, the operator followed previously established empathic communication guidelines during all interactions. Verbal strategies included active listening, validation of patient concerns, avoidance of judgmental or dismissive comments, and the use of reassuring empathic statements such as: “I understand your anxiety, but this procedure is simple and usually painless” and “Many patients feel apprehensive initially, but there is no reason to worry today.” Non-verbal strategies included maintenance of eye contact, calm voice modulation, appropriate facial expressions, nodding, welcoming posture, and gentle touch on the forearm when explaining procedures, whenever considered appropriate and acceptable by the participant.

Participants allocated to the combined intervention group received both expectancy and empathy manipulation protocols simultaneously, while the control group underwent the periodontal examination under standard clinical communication conditions without structured expectancy or empathy enhancement. To improve reproducibility and reduce operator-related variability, all interventions were delivered according to predefined scripts and behavioral guidelines established before study initiation. Periodic supervision and monitoring were performed throughout the study by the senior investigator (D.S.B.) to ensure adherence to the intervention protocols and consistency in communication delivery.

Blinding

To minimize the risk of bias, the study was conducted under blinded conditions whenever possible. Different researchers were responsible for intervention delivery, outcome assessment, and randomization procedures. The communication interventions and periodontal examinations were performed by one calibrated researcher (P.E.B.S.G.), whereas questionnaire application and outcome assessment were conducted by a second independent researcher (J.M.S.), who remained blinded to group allocation throughout the study.

Participants were not informed about the existence of different communication strategies or group allocations, thereby reducing the likelihood of expectation-related bias. Instead, participants were informed only that the study aimed to evaluate patient perceptions and experiences during periodontal clinical examination. To ensure consistency and intra-examiner reliability, calibration and periodic supervision procedures were performed throughout the study under the oversight of the senior investigator (D.S.B.). All study personnel were instructed not to disclose group allocation during participant interaction or data collection procedures.

Clinical and demographic data

Sociodemographic data were retrieved from participants' dental records. Periodontal clinical parameters included plaque index, calculus, probing depth, clinical attachment level, bleeding on probing, gingival recession, furcation involvement, tooth mobility, and suppuration. These were measured at six sites per tooth of all present teeth, following the current classification system of the American Academy of Periodontology and the European Federation of Periodontology¹⁵.

Outcomes

The primary outcome of this study was patient-reported fear related to the periodontal clinical examination, assessed immediately after the procedure using a visual analogue scale (VAS). Fear was selected as the primary endpoint because reducing anxiety and improving patient acceptance represent clinically relevant objectives in periodontal care and are directly associated with patient adherence to preventive and therapeutic procedures. Secondary outcomes included PROMs and PREMs related to pain perception, pain expectation, anxiety, satisfaction, mood, empathy perception, and overall patient experience during the periodontal examination.

All questionnaires and assessment instruments were administered in validated Portuguese-language versions immediately before (T0) and immediately after (T1) the periodontal examination by a blinded researcher (J.M.S.) who was not involved in intervention delivery or clinical examination procedures.

Patient expectation regarding pain or discomfort during the examination was assessed before the procedure using a 10-cm visual analogue scale (VAS)¹⁶, ranging from “no expected pain/discomfort” to “worst possible expected pain/discomfort.” Actual pain intensity immediately after the examination was measured using a Numeric Rating Scale (NRS, 0–10), in which 0 represented “no pain” and 10 represented “worst possible pain”¹⁷.

Anxiety levels were evaluated immediately before and after the examination using the validated Portuguese version of the State-Trait Anxiety Inventory – State subscale (STAI-state)¹⁸. The instrument consists of 10 items scored on a 4-point Likert scale ranging from 1 (“not at all”) to 4 (“very much”), with higher scores indicating greater anxiety levels.

Mood changes were assessed pre- and post-examination using the validated Portuguese version of the Positive and Negative Affect Schedule (PANAS)¹⁹, which contains 20 items divided into two subscales:

positive affect and negative affect. Each item is scored from 1 (“very slightly or not at all”) to 5 (“extremely”), with higher scores indicating greater emotional intensity.

Perceived empathy during the clinical encounter was evaluated immediately after the examination using the Consultation and Relational Empathy (CARE) measure²⁰, adapted by replacing the term “doctor” with “dentist.” The CARE measure assesses patients’ perceptions of professional empathy and interpersonal interaction quality during clinical care, with higher scores reflecting greater perceived empathy.

Patient satisfaction, overall examination experience, fear perception, and likelihood of recommending the procedure or professional were assessed using visual analogue scales and adapted items from the Consumer Quality Index (CQ-index)²¹. Higher scores indicated greater satisfaction and more positive patient experiences.

To evaluate the consistency of empathic communication delivery, the empathic personality trait of the operator was assessed using the Interpersonal Reactivity Index (IRI)¹, a multidimensional instrument composed of four domains: empathic concern, perspective-taking, fantasy, and personal distress. Higher scores indicate greater empathic disposition. All outcomes were considered exploratory due to the pilot nature of the study, and were included to provide preliminary estimates for future adequately powered randomized clinical trials.

Statistical analysis

Descriptive statistics included absolute and relative frequencies for categorical variables, and means with standard deviations for continuous variables. Sex was analyzed dichotomously, and questionnaire responses were treated as ordinal or quantitative variables, depending on scale structure. Between-group comparisons for categorical data were performed using Pearson’s chi-square test. Continuous or ordinal variables across three or more groups were compared using the Kruskal–Wallis test, while pairwise

comparisons were conducted with the Mann–Whitney U test followed by post-hoc Bonferroni test. Correlations between baseline (T0) and post-intervention (T1) measures were examined using Spearman's rank correlation coefficient in each experimental group. Statistical significance was set at $p \leq 0.05$. All analyses were performed using SPSS® (IBM Corp., Armonk, NY, USA).

RESULT

Participant characteristics

A total of 24 individuals aged between 19 and 62 years were enrolled and equally distributed across the four experimental groups ($n = 6$ per group) (Figure 1). Most participants were women, and no significant differences in age or sex distribution were observed among groups (Pearson's chi-square test, $p = 0.528$). Periodontal examination demonstrated that all participants were periodontally healthy. Mean periodontal parameters were consistent with periodontal health, with bleeding on probing affecting fewer than 10% of sites in all groups and no participants meeting the diagnostic criteria for periodontitis (Table 1). No significant between-group differences were observed at baseline for expected pain/discomfort, anxiety (STAI-state), or mood (PANAS) (all $p > 0.05$) (Table 2).

Primary outcome

The primary outcome was fear associated with the periodontal clinical examination. Before the examination, participants allocated to the expectancy manipulation groups reported higher anticipatory fear than those in the CTL and EMP groups. Following the examination, fear scores differed significantly among groups ($p = 0.034$), with participants receiving empathy-enhanced communication reporting the lowest fear levels (Table 2).

Secondary outcomes

No significant differences were observed among groups regarding anxiety (STAI-state) or mood (PANAS) before or after the periodontal examination (all $p > 0.05$). Significant between-group differences were identified for CARE scores after the intervention ($p = 0.009$), indicating higher perceived empathy among participants exposed to empathy-enhanced communication strategies. Participants receiving empathy-based communication also reported higher satisfaction with the periodontal examination and more favorable evaluations of the professional–patient interaction. Pain perception during or immediately after the periodontal examination tended to be higher among participants allocated to the combined expectancy and empathy intervention group. The likelihood of recommending both the periodontal examination and the professional was high across all experimental groups.

Exploratory analyses

Descriptive analyses of PROMs and PREMs demonstrated generally more favorable outcomes among participants exposed to empathy-enhanced communication. Compared with the CTL and expectancy manipulation groups, participants in the EMP group reported lower fear scores, greater comfort, and higher satisfaction. Analysis of the CQ-index responses also indicated a positive patient experience across all groups, with higher satisfaction and interpersonal evaluation scores observed in participants receiving empathy-enhanced communication (Table 2).

DISCUSSION

This pilot randomized clinical trial revealed distinct patterns of response to expectancy- and empathy-based communication during periodontal examination. Empathy-enhanced communication was associated with lower fear and greater patient satisfaction, whereas expectancy manipulation alone did not produce

comparable emotional benefits and appeared to increase anticipatory concern. Notably, combining expectancy and empathy did not result in an apparent additive benefit and was associated with a tendency toward greater pain perception during or immediately after the examination. Although these findings require cautious interpretation given the small sample size, they suggest that cognitive expectancy and relational empathy may influence different dimensions of the patient experience and may not necessarily exert additive effects when delivered simultaneously.

The primary outcome of this study was fear associated with the periodontal examination. Participants exposed to empathy-enhanced communication reported significantly lower fear following the examination than those receiving standard communication. Because all participants presented similar periodontal conditions and no participant had periodontitis, differences in fear were unlikely to be explained by disease severity or clinical variability. Instead, these findings suggest that the communication strategy itself influenced patients' emotional responses during the examination. This observation is clinically relevant because fear and anxiety are recognized barriers to regular dental attendance and may negatively influence acceptance of periodontal diagnosis, treatment, and long-term maintenance.

In contrast to empathy manipulation, expectancy manipulation alone did not improve the primary outcome. Participants receiving expectancy-oriented communication showed greater anticipatory fear and did not experience the reduction in fear observed in the empathy group. Although positive expectations can contribute to placebo-related improvements in pain and other subjective outcomes, expectancy effects are highly dependent on how verbal information is framed and interpreted by the patient. In the present study, the expectancy intervention provided relatively detailed information about the periodontal examination and explicitly emphasized that the procedure was generally painless. While intended to provide reassurance, directing attention toward the possibility of pain or discomfort may paradoxically increase anticipatory monitoring of these sensations. Thus, the intervention may have increased the

salience of the upcoming procedure. Interestingly, expectancy manipulation also appeared to stimulate greater patient interest in the examination, suggesting that its effects may have been more evident in cognitive engagement with the procedure than in emotional reassurance. These findings should nevertheless be interpreted with caution, particularly because the small number of participants in each group increases the susceptibility of these observations to individual differences in previous experiences, anxiety, pain sensitivity, and interpretation of verbal information.

The findings in the combined expectancy and empathy group are also noteworthy. Contrary to a simple additive model, simultaneously providing positive expectancy information and enhanced empathic communication did not appear to produce greater benefits than empathy alone and was associated with a tendency toward greater pain perception during or immediately after the examination. This observation suggests that expectancy and empathy should not necessarily be considered independent therapeutic components whose effects increase when combined. Expectancy manipulation primarily targets cognitive predictions regarding an upcoming experience, whereas empathic communication may act predominantly through relational processes such as reassurance, trust, emotional regulation, and perceived support. When both strategies are delivered simultaneously, their effects may therefore interact in a more complex manner rather than summate.

Some mechanisms could potentially explain this pattern. First, the additional procedural information provided during expectancy manipulation may have increased attention to pain-related sensations, partially counteracting the emotional reassurance generated by empathic communication. Second, explicitly describing the examination as generally painless may have established a relatively strong reference point against which subsequent sensations were evaluated. Even mild discomfort experienced during probing could therefore become more noticeable when compared with an expectation of little or no pain. Such an expectancy–experience mismatch could contribute to higher pain ratings without

necessarily worsening the overall interpersonal experience. Third, the combined intervention involved a greater amount and complexity of communication than either intervention alone. It is conceivable that additional reassurance and procedural information increased the salience of the examination and encouraged greater monitoring of bodily sensations. Due to the nature of this study, these explanations cannot be distinguished and further studies are warranted to investigate such possible mechanisms.

The secondary outcomes further support the importance of empathy during periodontal care. Participants exposed to empathy-enhanced communication reported higher CARE scores, greater satisfaction, and more positive evaluations of the professional–patient interaction. These findings are consistent with previous studies demonstrating that empathic communication improves patient-reported outcomes and strengthens the therapeutic relationship^{9, 22-25}. While most previous investigations have been conducted in medical settings, our study extends these observations to periodontal examination, suggesting that empathic communication can also enhance patient experience during routine dental procedures.

An interesting finding was that participants receiving empathy-based communication reported higher pain scores despite experiencing less fear and greater satisfaction. Because this study was not powered to investigate mechanisms underlying pain perception, these results should be interpreted cautiously. Similar observations have been reported previously, where empathy exerted stronger effects on emotional outcomes than on pain itself⁶. One possible explanation is that patients who feel more supported and listened to may pay greater attention to bodily sensations and therefore report discomfort more accurately. Alternatively, this finding may simply reflect the small sample size and exploratory nature of this pilot trial. Larger studies are required to determine whether this apparent dissociation between fear and pain represents a reproducible phenomenon.

The present findings also have important implications for periodontal practice. Periodontal examinations are often the patient's first contact with periodontal care and can influence acceptance of subsequent

diagnostic and therapeutic procedures. Communication strategies that reduce fear and improve patient satisfaction may facilitate acceptance of periodontal probing, improve adherence to supportive periodontal therapy, and strengthen long-term professional–patient relationships. These aspects are particularly relevant because recent EFP S3 clinical practice guidelines emphasize the importance of patient-reported outcome measures (PROMs) alongside conventional clinical parameters^{12, 13}. Our findings suggest that empathic communication may represent a practical approach to improving these patient-centered outcomes without requiring additional equipment, pharmacological interventions, or increased procedural complexity.

To our knowledge, this study is among the first randomized clinical trials to separately evaluate the effects of expectancy manipulation and empathy manipulation during periodontal examination using both PROMs and PREMs. The factorial design also allowed assessment of the independent and combined effects of these communication strategies within the same clinical setting. Despite these strengths, some limitations should also be acknowledged. As a pilot clinical trial, the study included a small sample size, limiting statistical power and generalizability. All participants were periodontally healthy, and therefore the findings cannot be directly extrapolated to patients with gingivitis or periodontitis, who may experience greater discomfort during periodontal probing. Another limitation is that previous dental anxiety, dental fear, and history of negative dental experiences were not systematically assessed at baseline. These factors may influence anticipatory fear, pain expectation, pain perception, and other patient-reported outcomes and could therefore have contributed to interindividual variability in the responses observed across groups. This is particularly relevant in a small pilot trial, in which randomization may not fully balance such psychological and experiential characteristics between groups. Future adequately powered studies should incorporate validated measures of baseline dental anxiety and fear, as well as previous negative dental experiences, to determine whether these factors modify the effects

of expectancy- and empathy-based communication. In addition, although standardized communication scripts were used, complete standardization of interpersonal interactions is inherently challenging. Future adequately powered randomized clinical trials including patients with different periodontal conditions are needed to confirm these preliminary findings and determine whether empathy-enhanced communication improves patient adherence and clinical outcomes throughout periodontal therapy.

CONCLUSION

This pilot randomized clinical trial provides preliminary evidence that empathy-enhanced provider–patient communication may improve patient-reported experiences during periodontal examination, particularly by reducing fear and increasing satisfaction. In contrast, expectation manipulation alone did not appear to confer similar benefits and may have increased anticipatory fear in some participants. Although these findings suggest that communication strategies may influence patients' experiences during periodontal examination, the small sample size and preliminary nature of this study preclude definitive conclusions. Larger, adequately powered randomized clinical trials are needed to confirm these findings and determine the role of empathy- and expectation-based communication strategies in improving patient-reported outcomes and experiences in periodontal care.

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AUTHORS' CONTRIBUTIONS

Conceptualization: DSB; Methodology: PEBSG, JMS, FNA, MASF, FWMGM, RSM, MFF, and DSB; Validation: PEBSG, JMS, FNA, MASF, FWMGM, RSM, MFF, and DSB; Investigation: PEBSG, JMS, FNA, MFF, and DSB; Writing, original draft preparation: RSM, MFF, and DSB; Writing, review and editing: PEBSG, JMS, FNA, MASF, FWMGM, RSM, MFF, and DSB; Funding acquisition: MASF, RSM, MFF, and DSB; Supervision: DSB. All authors have read and agreed to the published version of the manuscript.

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CONFLICTS OF INTERESTS

The authors declare that they have no conflict of interest.

DATA AVAILABILITY

The data supporting this study are available from the corresponding author upon reasonable request.

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Figure legends:

Figure 1. Consort flow diagram of the study.

Table legends:

Table 1. Summary of participant age and baseline periodontal clinical parameters according to experimental groups.

Table 2. Summary of patient-reported outcomes and experience measures according to experimental groups.

CONSORT Flow Diagram

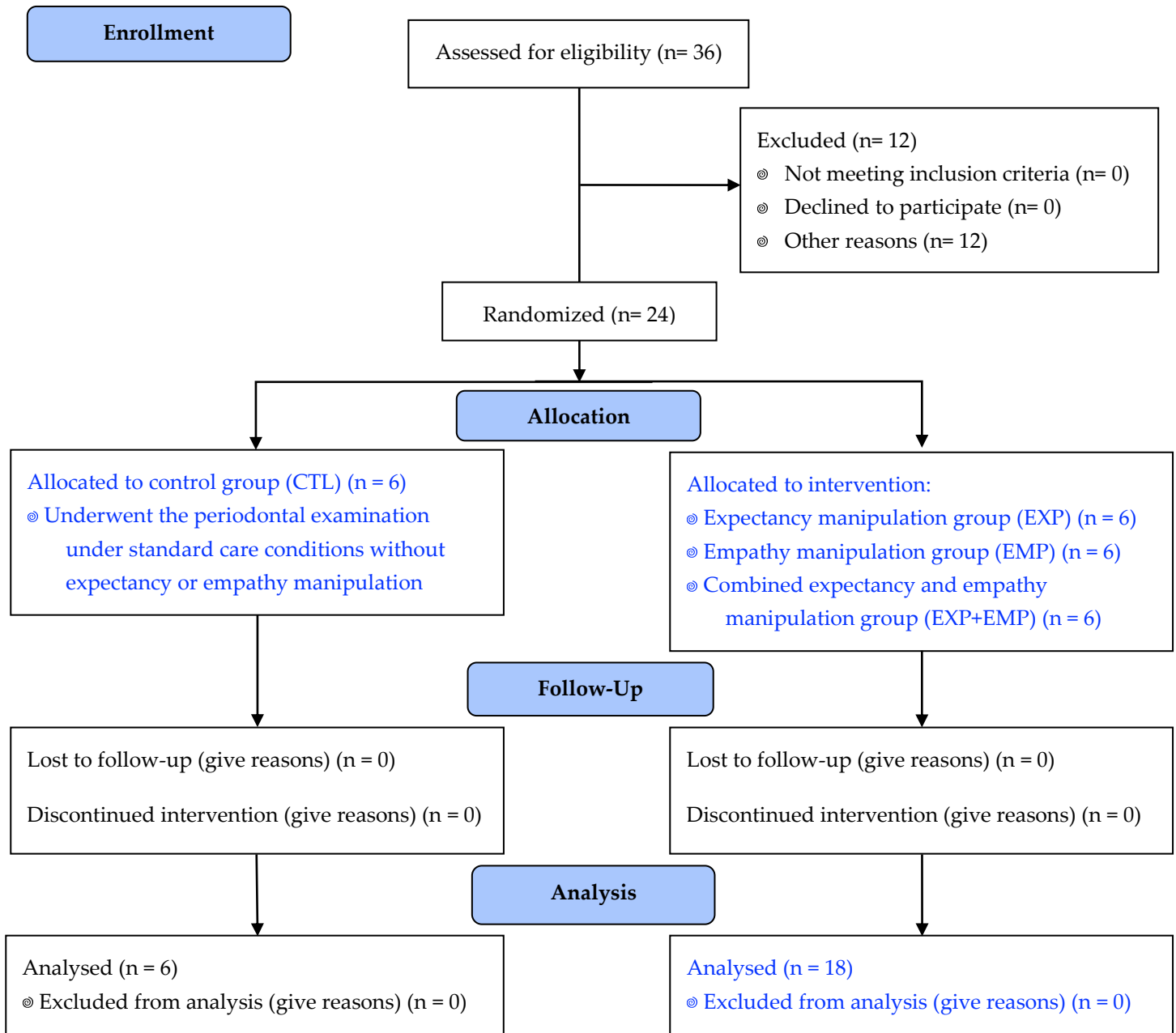


Table 1. Summary of participant age and baseline periodontal clinical parameters according to experimental groups

Outcome	CTL (n=6) Mean ± SD	EXP (n=6) Mean ± SD	EMP (n=6) Mean ± SD	EXP+EMP (n=6) Mean ± SD	p- value
Age (years)	49.50 ± 18.05	34.83 ± 13.92	43.17 ± 5.12	35.33 ± 11.36	0.293
Teeth	22 ± 7.29	25.23 ± 2.07	24.83 ± 1.72	25 ± 1.67	0.858
Plaque index	30.17 ± 6.1	26.80 ± 15.07	31.87 ± 10.5	26.89 ± 14.31	0.804
Dental calculus	23.05 ± 5.27	18.09 ± 9.01	23.48 ± 9.28	19.29 ± 6.84	0.599
Probing depth	2.14 ± 0.27	2.14 ± 0.26	2.13 ± 0.31	2.12 ± 0.34	0.995
Gingival recession	0.12 ± 0.1	0.13 ± 0.1	0.08 ± 0.06	0.08 ± 0.06	0.550
Clinical attachment level	0.30 ± 0.22	0.33 ± 0.22	0.19 ± 0.12	0.20 ± 0.13	0.477
Bleeding on probing	7.58 ± 1	8.4 ± 1.44	7.06 ± 2.25	7,57 ± 2.06	0.561
Furcation involvement	—	—	—	—	—
Tooth mobility	—	—	—	—	—
Suppuration	—	—	—	—	—

Abbreviations: CTL, control group; EXP, expectancy manipulation; EMP, empathy manipulation; EXP+EMP, combined expectancy and empathy manipulation. Data analyzed using the Kruskal–Wallis test.

Table 2. Summary of patient-reported outcomes and experience measures according to experimental groups

Outcome	CTL (n=6) Mean $\pm$ SD	EXP (n=6) Mean $\pm$ SD	EMP (n=6) Mean $\pm$ SD	EXP+EMP (n=6) Mean $\pm$ SD	p-value
Expected pain/discomfort (T0)	3.17 $\pm$ 3.92	4.17 $\pm$ 2.79	3.00 $\pm$ 2.76	5.67 $\pm$ 2.07	0.418
STAI-state Part I (T0)	2.72 $\pm$ 0.74	2.47 $\pm$ 0.42	2.58 $\pm$ 0.47	2.89 $\pm$ 0.47	0.504
STAI-state Part II (T0)	2.86 $\pm$ 0.36	2.75 $\pm$ 0.33	2.67 $\pm$ 0.39	2.58 $\pm$ 0.18	0.455
PANAS (T0)	2.54 $\pm$ 0.60	2.68 $\pm$ 0.69	2.55 $\pm$ 0.42	2.66 $\pm$ 0.36	0.955
Fear before examination	0.83 $\pm$ 2.04	2.33 $\pm$ 3.50	1.00 $\pm$ 0.63	3.50 $\pm$ 2.43	—
Expected pain/discomfort (T1)	1.67 $\pm$ 3.14	2.67 $\pm$ 2.94	1.00 $\pm$ 2.00	3.00 $\pm$ 2.45	0.452
STAI-state Part I (T1)	2.39 $\pm$ 0.23	2.25 $\pm$ 0.28	2.19 $\pm$ 0.20	2.33 $\pm$ 0.15	0.398
STAI-state Part II (T1)	2.58 $\pm$ 0.31	2.81 $\pm$ 0.48	2.36 $\pm$ 0.25	2.64 $\pm$ 0.22	0.157
PANAS (T1)	3.54 $\pm$ 0.40	3.74 $\pm$ 0.41	3.44 $\pm$ 0.17	3.78 $\pm$ 0.28	0.258
Satisfaction with periogram	9.83 $\pm$ 0.41	9.83 $\pm$ 0.41	10.00 $\pm$ 0.00	10.00 $\pm$ 0.00	—
Pain during/after periogram	7.83 $\pm$ 4.02	9.50 $\pm$ 0.84	10.00 $\pm$ 0.00	9.17 $\pm$ 0.98	—
Fear during/after periogram	1.00 $\pm$ 2.00	2.00 $\pm$ 3.16	0.00 $\pm$ 0.00	3.83 $\pm$ 3.19	0.034*
CARE total score	3.43 $\pm$ 0.44	3.32 $\pm$ 0.31	3.64 $\pm$ 0.00	3.81 $\pm$ 0.20	0.009*

Abbreviations: CTL, control group; EXP, expectancy manipulation; EMP, empathy manipulation; EXP+EMP, combined expectancy and empathy manipulation; STAI, State-Trait Anxiety Inventory; PANAS, Positive and Negative Affect Schedule; CARE, Consultation and Relational Empathy measure.

Data analyzed using the Kruskal–Wallis test. *Statistically significant differences are indicated by an asterisk ($p < 0.05$).



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