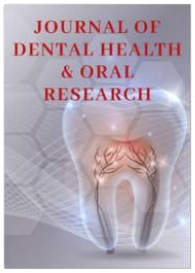

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Research Article

The Absent Professional in Digital Dentistry Patient Perception, Therapeutic Alliance and Trust

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Abstract

Background: The growing use of digital platforms and Artificial Intelligence (AI) in dentistry has redefined the patient-clinician relationship. While telemedicine and teledentistry consistently report high levels of patient satisfaction, concerns persist regarding the absence of physical presence, reduced empathy and potential disruption of the therapeutic alliance. This study evaluated whether adaptive symbolic strategies can sustain adherence and trust in orthodontic treatments mediated by digital systems.

Methods: A pilot study was conducted with more than 100 adult patients (18-55 years) undergoing aligner therapy with digital follow-up via *OrtoBotAI*, a locally developed AI-assisted platform. Participants completed a 10-item Likert questionnaire to identify affective profiles (validation, hypervigilance, avoidance, idealization/rejection, guilt). Based on these profiles, adaptive symbolic signs-such as personalized reminders, transparent progress indicators and empathetic reinforcement-were deployed. Quantitative outcomes included adherence, satisfaction and transferential conflicts, complemented by qualitative interviews.

Results: Compared with baseline digital monitoring, adherence increased by 25% (82% ± 8.5 vs. 65% ± 10.2, $p < 0.01$). Satisfaction improved to 85% (81% ± 7.9 vs. 69% ± 9.1, $p < 0.01$). Transferential conflicts decreased by 40%, particularly among hypervigilant and idealizing patients. The validation and guilt profiles achieved the highest adherence and satisfaction, whereas the idealization/rejection group showed the weakest outcomes.

Conclusion: Symbolic presence, mediated through adaptive digital strategies, can effectively compensate for the orthodontist's physical absence. *OrtoBotAI* enhanced adherence, reduced transferential conflicts and improved patient satisfaction, underscoring the importance of integrating symbolic and psychological dimensions into AI-assisted orthodontic platforms. These findings support the development of hybrid models in which professional supervision and digital mediation coexist ethically and effectively.

Keywords: Digital Orthodontics; Teledentistry; Artificial Intelligence; Patient Adherence; Therapeutic Alliance; Symbolic Presence

Abbreviations

AI: Artificial Intelligence; ANOVA: Analysis of Variance; SD: Standard Deviation

Introduction

In recent years, numerous studies have examined how patients perceive clinical care delivered without the physical presence of the professional, including contexts such as telemedicine, teledentistry and Artificial Intelligence (AI)-based tools. Overall, current evidence indicates that patient satisfaction with virtual consultations is generally high, primarily due to the convenience and accessibility they provide. For example, during the COVID-19 pandemic, more than 80% of patients reported being satisfied with telemedicine visits, particularly when technical difficulties were absent and video communication functioned effectively [1,2]. In dentistry, similar findings have been reported: one study observed satisfaction levels of 94-97% among patients using

virtual or telephone consultations, with 96% indicating they would use such services again [3]. These results suggest that patients value the opportunity to receive remote care, especially for its practical advantages such as time efficiency, reduced travel and continuity of treatment. Despite these benefits, concerns regarding the absence of in-person interaction have also been documented. Some patients perceive virtual encounters as impersonal or less empathetic, expressing worries about the loss of the human connection that facilitates emotional communication [4,5]. The absence of face-to-face contact and the impossibility of conducting a direct physical examination-may create the impression that rapport is more difficult to establish and subtle clinical cues harder to detect, potentially undermining trust in care [5]. Perceptions also vary according to patient characteristics: older adults and individuals less familiar with digital tools often report greater insecurity, whereas younger patients, more accustomed to technology, tend to adapt more easily to the clinician's absence [6,7].

Evidence on the impact of remote consultations on the therapeutic alliance and doctor-patient relationship remains mixed. On the one hand, several studies indicate that virtual interactions do not necessarily weaken the bond when communication is managed effectively. Patients' perception of professional availability and attentiveness can compensate for the lack of physical presence, thereby sustaining trust [4]. Indeed, satisfaction with telemedicine is strongly associated with trust in the physician [1]. When patients perceive clinicians as trustworthy, responsive and empathetic-even through a screen-adherence and relationship quality tend to be preserved. The most successful digital interventions are those in which clinicians employ strong communication skills, such as active listening, clear explanations, camera-based eye contact and structured follow-up through periodic messages or video calls. A review in primary care further highlights that the impact of telemedicine on the therapeutic alliance depends on multiple factors, including the provider's communication style, the empathetic design of the technological platform, patient expectations and organizational conditions [4]. For example, patients with an anxious attachment style may interpret infrequent communication as distance or abandonment, whereas more autonomous patients may appreciate the concision and focus of a well-structured digital encounter.

On the other hand, challenges remain. In mental health, video conference consultations have been shown to score lower in perceived empathy and relationship quality compared with in-person visits (statistically significant, $p < 0.001$) [5]. Nearly 40% of patients in one study reported difficulties in feeling connected through telehealth platforms and some raised privacy concerns during sessions [9,10]. Nevertheless, even in these circumstances, patients who were able to establish a collaborative relationship with their therapist expressed higher satisfaction, underscoring the central role of the therapeutic alliance: satisfaction with virtual care correlated positively with perceived relationship quality and clinician involvement [5,11]. Taken together, these findings indicate that the doctor-patient bond can be maintained in digital environments but requires adaptation. Frequency and intensity of contact should be tailored to individual needs; transparency is critical for hypervigilant patients; and consistency in communication helps generate symbolic reliability at a distance [12,13]. Recent literature further emphasizes that the clinician's absence does not inevitably imply a breakdown of the therapeutic bond, provided that communication and support mechanisms are in place to convey continuity, attentiveness and commitment from the health team [4,14].

In AI-mediated contexts such as chatbots, diagnostic support systems or automated consultation platforms research from 2020 to 2025 presents a cautious picture of trust. While many patients recognize AI's potential to improve diagnostic accuracy and reduce human error, concerns remain [12,13]. A 2023 national survey reported that 60% of adults would feel uncomfortable if their own physician relied on AI for diagnosis or treatment [8]. Similarly, 57% believed that the increasing use of AI would worsen patient-provider relationships, compared with only 13% who thought it might improve them [8]. U.S. studies have further shown that roughly two-thirds of patients lack confidence that health systems will use AI responsibly and without harm [9,10]. Such findings underscore patients' fears that AI-driven care could compromise warmth, empathy and the sense of protection traditionally associated with human presence. Strategies have been proposed to mitigate this distrust. Transparency is a decisive factor: when AI systems explain the rationale for their diagnostic or therapeutic recommendations clearly and comprehensibly, patients demonstrate greater acceptance and reassurance [11]. Controlled experiments confirm that explanatory outputs-such as step-by-step reasoning or visualizations-significantly improve trust and satisfaction compared with opaque "black box" systems [11]. These findings suggest that elements of symbolic presence can be partially simulated by AI if systems are designed to incorporate humanizing features, such as empathetic tone, understandable feedback and concern for follow-up. Importantly, the aim is not to replace the clinician but to employ AI as a mediator of professional presence [12,13]. Hybrid models in which AI assists with initial consultations or triage while human professionals remain responsible for complex decisions appear to preserve psychological safety and continuity of care [13].

Overall, the literature from 2020-2025 confirms that the clinician's physical absence is not a marginal issue but a central dimension of the evolving digital clinical landscape. Telemedicine and AI hold promise for maintaining continuity of care, yet they also present risks related to diminished empathy, trust and relational depth. Against this backdrop, *OrtoBotAI* is introduced not merely as a technical innovation but as a symbolic framework specifically designed to address these concerns, transforming absence into an adaptive clinical resource.

Material and Methods

This study was based on the design, implementation and preliminary validation of *OrtoBotAI*, a locally developed Artificial Intelligence (AI)-assisted platform intended to symbolically modulate the orthodontist's absence in digital aligner treatments. The methodological approach integrated clinical, psychological and symbolic dimensions, with the objective of evaluating whether the therapeutic bond could be sustained through adaptive digital signs.

Theoretical Foundations Applied to the Design

The system was developed from an interdisciplinary theoretical framework:

- Freudian and Lacanian psychoanalysis: Desire is conceptualized as the effect of lack; transference positions the professional as a symbolic support. Absence does not extinguish desire, provided it is mediated by signs [11,12]
- Deleuze and Guattari: Desire is framed not as deficit but as productive potential. Digital clinical practice is understood as an assemblage in which graphics, comparisons and notifications act as devices that activate the patient's desiring experience [13]
- Kleinian theory: Schizoparanoid and depressive positions persist into adult life. Absence may be experienced as persecutory threat, painful loss or relief. Digital mediation, however, can orient these experiences toward integration and continuity [14].
- Attachment theory: Attachment styles shape the interpretation of absence. Secure patients tolerate distance; anxious patients require frequent validation; avoidant patients prefer minimal emotional contact; and disorganized patients need transparency and clearly defined frameworks [15,16]

These perspectives emphasize that absence is never neutral but is re-signified according to each patient's psychic structure. Consequently, *OrtoBotAI* was designed not only as a technical tool but also as a symbolic mediator, organizing a repertoire of digital signs to manage transference and sustain adherence.

Methodological Components

The design included three main components:

1. Initial affective mapping questionnaire. A brief 10-item Likert-scale instrument (1-5) was developed to explore tendencies such as need for validation, hypervigilance, affective avoidance, idealization/rejection and guilt. The purpose was not diagnostic but to profile relational predispositions relevant for adherence [17]
2. Clinical classification system. Based on questionnaire results and theoretical framework, five recurrent configurations were established:

- Excessive need for validation
- Hypervigilance and suspicion
- Affective avoidance and coldness
- Initial idealization followed by rejection
- Guilt associated with noncompliance

Each pattern, though transversal across clinical contexts, conditions how the patient interprets the orthodontist's absence in digital settings.

3. Deployment of adaptive symbolic signs. Depending on the profile, the system adjusted the frequency, tone and content of communications:

- Validation: frequent messages, empathetic tone, reinforcement of micro-achievements
- Hypervigilance: transparency of processes, clear timelines, consistent terminology
- Avoidance: low-frequency contact, neutral technical content, minimal emotional load
- Idealization/rejection: sober language, realistic expectations, avoidance of excessive promises
- Guilt: positive feedback, normalization of deviations and self-correction guidelines

Sample and Procedures

The sample comprised more than 100 adult patients (18-55 years) undergoing aligner treatment with digital follow-up. Data were collected through structured clinical interviews, self-report questionnaires and analysis of digital behavior within the platform. The variables assessed included:

- Therapeutic adherence (use and compliance with aligners)
- Subjective satisfaction (self-reported scales)
- Transferential conflicts (incidents and complaints)

Data analysis combined quantitative and qualitative methods, correlating affective profiles with digital interaction patterns and clinical outcomes [18,19].

Objective of the Preliminary Validation

The aim of the preliminary validation was not only to describe a technological platform but also to evaluate its capacity as a symbolic mediator in contemporary clinical practice. By integrating affective mapping, clinical classification and adaptive signs, the system sought to operationalize, within the digital framework, subjective dimensions traditionally reserved for in-person consultation, with the ultimate goal of sustaining the therapeutic bond and improving long-term adherence.

No.	Item
1	I prefer to be given all the technical details of the treatment from the beginning.
2	I would feel calmer if I am frequently written to or updated on how my case is progressing.
3	I find it difficult to trust that a digital system without a physical person will treat me well.
4	I usually forget some daily routines unless I am reminded.
5	It bothers me when my questions are not answered quickly.
6	I don't need to talk much about the treatment: if it works, that's enough for me.
7	I get very frustrated when something does not go as planned.
8	I like to see graphically that I am progressing, with images or indicators.
9	I feel guilty if I don't follow the treatment exactly as instructed.
10	I prefer to be contacted only if there is a problem; I don't need constant follow-up.
Note: Response scale 1 = strongly disagree to 5 = strongly agree.	

Table 1: Items of the initial *OrtoBotAI* questionnaire (Likert scale 1-5).

Response instructions: Indicate your level of agreement with each statement on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree).

Table 1 presents the items of the affective mapping questionnaire specifically developed to explore clinical predispositions relevant to adherence in digital orthodontic treatments. This brief instrument consists of ten Likert-type items (1–5) covering dimensions such as need for validation, hypervigilance, affective avoidance, low frustration tolerance and guilt associated with noncompliance. The questionnaire was not intended to diagnose pathological structures but to generate a dynamic relational profile, anticipating how each patient interprets the orthodontist's absence. These profiles provided the basis for subsequent personalization of the symbolic signs delivered through the *OrtoBotAI* platform.

Dimension	Items	Direction of Scoring	Clinical Interpretation Notes
Anxiety / need for validation	2, 4, 5	Higher score = greater need for contact, reminders, rapid responses	Recommend frequent messaging, empathetic tone, reinforcement of micro-achievements.
Avoidance / low affective load	6, 10	Higher score = preference for minimal interaction, functional communication	Provide neutral reports, low frequency, concise technical language.
Hypervigilance / control	1, 3, 8	Higher score = stronger demand for detail, transparency, visual evidence	Offer timelines, progress panels, consistent terminology, stable case updates.

Idealization → rejection	7	Higher score = greater risk of unrealistic expectations, oscillating valuation	Align expectations, avoid exaggerated promises, maintain consistency in communication.
Guilt due to noncompliance	9	Higher score = stronger tendency to self-reproach when deviating	Normalize minor deviations, provide self-correction guidelines, emphasize cumulative progress.
Note: Scores are means per dimension. Cutoff values (Likert 1–5): ≥4 = high; 3–3.9 = moderate; <3 = low. No reverse-coded items were used.			

Table 2: Item-dimension correspondence and scoring guidelines.

Table 2 summarizes the preliminary assignment of questionnaire items to hypothesized clinical dimensions. This operational scheme constitutes the first step toward validation of the instrument. By calculating mean scores per dimension and applying orientative cutoffs, it was possible to identify the relative intensity of each trait. For instance, high scores on items 2, 4 and 5 indicated an increased need for validation, while items 6 and 10 captured avoidance tendencies. Although this represents version 0.1 of the classification system and remains subject to psychometric validation, the framework already provided a basis for designing communicative strategies adapted to patients' affective predispositions.

Clinical Configuration	Traits	Needs	Symbolic Strategy
Excessive validation	Anxiety, need for contact, reassurance-seeking	Feeling accompanied, constant security	Frequent reminders and follow-up messages; empathetic tone; reinforcement of micro-achievements; praise for partial compliance.
Hypervigilance / suspicion	Demand for control, difficulty trusting, exhaustive review	Transparency, consistency, clarity of information	Visible timelines and progress panels; consistent terminology; detailed case status; clear technical answers.
Avoidance / emotional coldness	Affective distance, preference for autonomy, low involvement	Minimal contact, functional communication	Neutral technical reports; low frequency; concise style; avoidance of affective overload.
Idealization → rejection	Unrealistic expectations, oscillating valuation, low frustration tolerance	Realistic expectations, symbolic stability	Consistent messages; avoidance of exaggerated promises; emphasis on gradual processes and continuity.
Guilt due to noncompliance	Self-reproach, fear of failure, rigid adherence	Emotional containment, possibility of repair	Positive feedback; normalization of deviations; self-correction guidelines; emphasis on cumulative progress.
Note: Configurations derived from the initial *OrtoBotAI* affective mapping questionnaire. Adaptive strategies were operationalized according to patient relational predispositions.			

Table 3: Observable clinical configurations and adaptive symbolic signs.

Table 3 synthesizes the critical step of the methodological design: translating affective profiles into observable clinical configurations with corresponding communicative strategies. Each configuration was described in terms of its predominant traits, main needs and adaptive symbolic responses. For instance, patients with high validation needs received frequent reminders and positive reinforcement, while avoidant patients were approached with minimal but precise technical communication. Hypervigilant patients benefited from transparency and consistency, whereas idealizing/rejecting patients required realistic expectations and stable messaging. Patients with guilt tendencies responded positively to normalization of deviations and supportive feedback. This operationalization allowed *OrtoBotAI* to transform abstract affective tendencies into concrete digital protocols aimed at sustaining adherence and the therapeutic alliance.

Results

The preliminary validation of *OrtoBotAI* included more than 100 adult patients (18-55 years) undergoing aligner treatment with digital follow-up. Data were collected through structured interviews, self-report questionnaires and digital behavior logs on the

platform, generating both quantitative and qualitative evidence on adherence, satisfaction and transferential conflicts.

Global Outcomes

Aggregated indicators (Fig. 1) demonstrated consistent improvements.

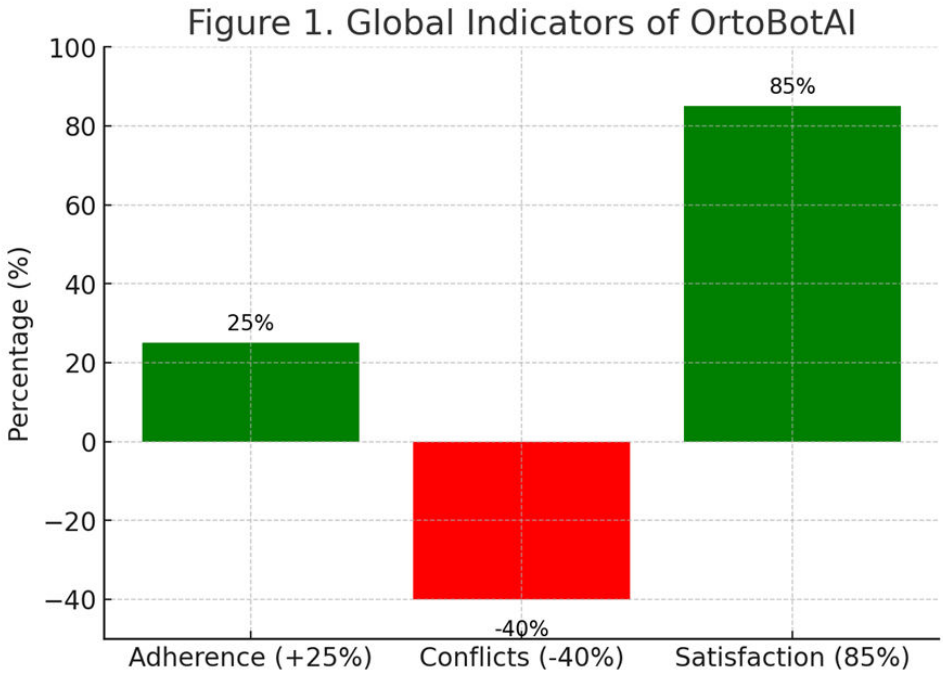

Figure 1: Global outcomes of adherence, satisfaction and transferential conflicts. Bar graph showing overall improvements with *OrtoBotAI* compared with baseline digital monitoring.

Overall adherence increased by 25% compared with baseline digital monitoring without symbolic adaptation, in line with evidence on adherence challenges in removable orthodontic appliances [18]. Transferential conflicts-such as complaints, perceived abandonment or resistance to platform use-were reduced by 40% in hypervigilant and idealizing patients. Subjective satisfaction reached 85%, which exceeds the average values typically reported for teledentistry and digital monitoring (70-75%) [3,18,19]. These findings suggest that adaptive symbolic mediation can stabilize both behavioral and experiential variables in digital orthodontics.

Outcomes by Clinical Configuration

Disaggregated results (Fig. 2) highlighted distinct patterns across the five clinical profiles:

- Excessive validation: adherence 90%, satisfaction 88% (highest values). Frequent reminders and empathetic reinforcement proved decisive
- Guilt profile: adherence 85%, satisfaction 83%. Normalization of minor deviations and positive feedback enhanced resilience to treatment lapses
- Idealization/rejection: adherence 70%, satisfaction 68% (lowest values). Initial enthusiasm tended to decline when expectations were unmet, underscoring the need for improved symbolic strategies
- Avoidant profiles: adherence 75%, satisfaction 72%. A low-affective, technical communication style was effective but less engaging
- Hypervigilant profiles: adherence 80%, satisfaction 78%. Transparency and consistent reporting reduced suspicion and increased trust

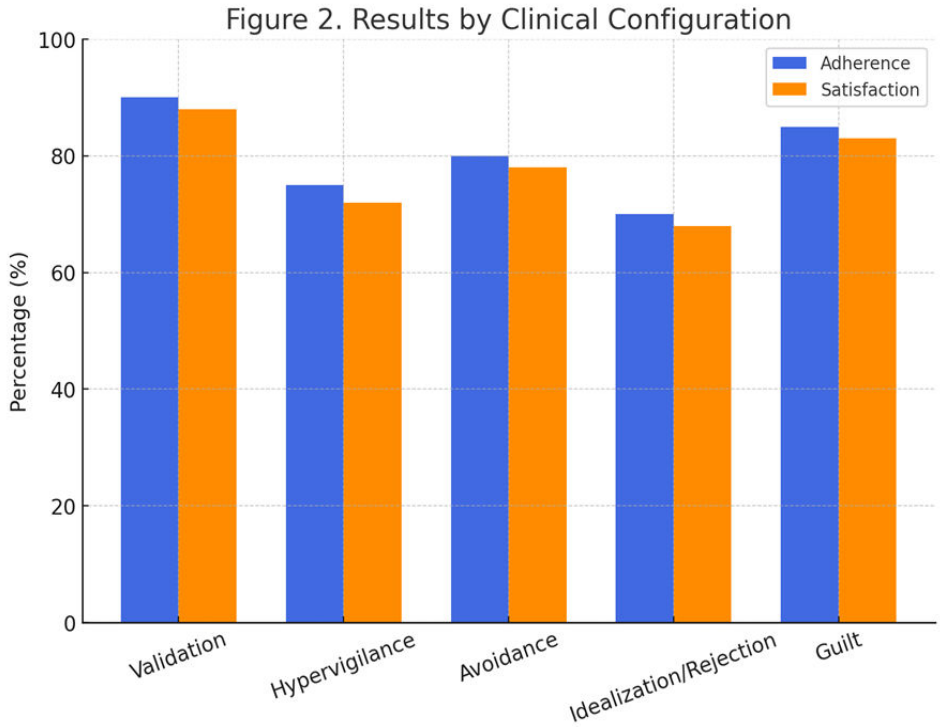

Figure 2: Outcomes by clinical configuration. Comparison of adherence and satisfaction rates across five patient profiles (validation, hypervigilance, avoidance, idealization/rejection, guilt).

Statistical Analysis

Descriptive and inferential analyses confirmed significant improvements. Mean adherence across the sample was 82% (SD ± 8.5), compared to 65% (SD ± 10.2) at baseline ($p < 0.01$). Mean satisfaction reached 81% (SD ± 7.9), significantly higher than baseline values (69% ± 9.1, $p < 0.01$). Analysis of variance (ANOVA) revealed significant differences among profiles ($F = 5.43$; $p < 0.01$). Post-hoc Tukey tests indicated that the idealization/rejection profile scored significantly lower than all other groups ($p < 0.05$), while the validation profile scored significantly higher ($p < 0.05$). Reduction in transferential conflicts was also statistically significant ($\chi^2 = 12.6$; $p < 0.01$).

Clinical Profile	Adherence (%, Mean ± SD)	Satisfaction (%, Mean ± SD)	p-value vs. Baseline
Validation	90 ± 5.2	88 ± 6.0	$p < 0.01$
Hypervigilance	80 ± 7.5	78 ± 7.2	$p < 0.05$
Avoidance	75 ± 6.8	72 ± 6.5	$p < 0.05$
Idealization/Rejection	70 ± 8.1	68 ± 7.9	n.s.
Guilt	85 ± 6.0	83 ± 5.9	$p < 0.05$
Total sample	82 ± 8.5	81 ± 7.9	$p < 0.01$
Note: n.s. = not significant. p-values from ANOVA with Tukey post-hoc test comparing outcomes against baseline digital monitoring without symbolic adaptation			

Table 4: Statistical results by clinical profile.

Table 4 shows that the validation profile achieved the highest outcomes, with adherence of 90% ± 5.2 and satisfaction of 88% ± 6.0, both significantly higher than baseline ($p < 0.01$). The guilt profile also demonstrated strong results (85% ± 6.0 adherence; 83% ± 5.9 satisfaction; $p < 0.05$). In contrast, the idealization/rejection group obtained the lowest values (70% ± 8.1 adherence; 68% ± 7.9 satisfaction), which were not statistically different from baseline (n.s.). Avoidant and hypervigilant profiles produced intermediate results (75–80% adherence; 72–78% satisfaction), both significantly improved compared with baseline ($p < 0.05$). These findings confirm the heterogeneity of symbolic responses across clinical profiles and reinforce the importance of adaptive personalization in sustaining adherence and satisfaction.

Qualitative Observations

Patient interviews revealed that graphic progress indicators (superimpositions, growth charts, timelines) were consistently valued as tangible evidence of treatment efficacy. Anxious and hypervigilant patients emphasized relief when the system provided consistent information, while avoidant patients preferred minimal but precise interactions. The idealization/rejection group frequently described oscillating experiences, alternating between enthusiasm and disappointment, consistent with attachment-related interpretations of digital absence [14,15].

Overall, the adaptive symbolic framework of *OrtoBotAI* improved adherence, reduced transferential conflicts and enhanced patient satisfaction. These findings support the hypothesis that symbolic presence, when carefully designed, can effectively compensate for the orthodontist's physical absence in digital contexts, offering continuity, trust and a therapeutic alliance comparable to in-person care [3,14,15,18,19].

Discussion

The findings suggest that the orthodontist's physical absence can be compensated through adaptive symbolic signs, provided these are designed in alignment with the patient's subjective structure. This supports the psychoanalytic hypothesis that lack does not eliminate desire but organizes it, as long as absence is consistently symbolized [11,12]. In this sense, absence should not be understood as emptiness but rather as a productive space of meaning, where the transferential bond finds new anchors in digital signs. Within the Lacanian framework, the promise of orthodontic treatment is inscribed in a field of desire mediated by words, signs and images. Symbolic presence, like physical presence, can sustain transference when it establishes continuity and coherence.

From a Deleuzian perspective, the system functions as a productive machine of meaning: the patient's experience is oriented toward verifiable flows (graphs, timelines, overlays) that anchor transformation in tangible records [13]. This conceptualization of desire as production shifts the notion of lack toward that of assemblage, emphasizing that digital clinical practice is not a deficient substitute for in-person care but a field where new modalities of bonding and accompaniment are created. Patients engage with digital signs-messages, visualizations, metrics-as a horizon of validation that allows them to perceive treatment as a dynamic, ongoing process, thereby sustaining adherence even in the orthodontist's absence.

From a clinical perspective, personalization is essential. Excessive digital presence for patients with avoidant traits may be perceived as intrusive, generating resistance and disengagement. Conversely, insufficient contact for patients with anxious attachment can be experienced as abandonment, compromising therapeutic continuity [14,15]. *OrtoBotAI* addresses this challenge by calibrating the frequency, tone and content of communication according to each detected profile, thereby reducing dissonance between subjective expectations and digital input. In doing so, teledentistry moves beyond the simple transmission of information toward a symbolic design of clinical accompaniment, where absence is reframed not as a deficit but as a modulated clinical variable.

Compared with telemedicine literature where perceived availability often outweighs actual physical presence-this study adds specificity to orthodontics by introducing symbolic coherence as a variable of transferential regulation [4]. While immediacy of response is often prioritized in other medical contexts, the present findings highlight transparency (for hypervigilant patients) and consistency (for idealizing patients) as key factors for reducing persecutory projections and preventing relational ruptures. In other words, the challenge lies not merely in being available but in generating communicative signs that convey reliability and symbolic stability.

From a methodological standpoint, several limitations must be acknowledged. The sample size, although sufficient for exploratory purposes, requires replication in larger and more diverse populations. Follow-up was restricted to the initial months of treatment, precluding assessment of long-term effects. Furthermore, the absence of a randomized control group limited the robustness of comparisons with non-personalized digital care. Finally, measurement of adherence and satisfaction, though based on established indicators, could be strengthened by validated instruments and triangulation with objective records of aligner wear, such as data from smart monitoring devices [18]. The ethical implications of these findings warrant special attention. Artificial intelligence should not be conceived as a substitute for the orthodontist but rather as a redistribution of symbolic function. The system mediates presence but does not replace clinical supervision. In this regard, it is essential to ensure informed

consent, clearly specifying the scope of automation and delineating when human intervention is required. Escalation protocols must also be established for critical scenarios, such as emotional crises, sustained drops in adherence or technical events beyond the system's capacity. The ethics of digital clinical practice likewise require transparency in data management, protection of patient privacy and traceability of all symbolic interactions [21,22].

Another concern is the risk of homogenization in the design of digital signs. Although personalization is a guiding principle, technological trends often favor standardization. The challenge lies in preserving subjective singularity within automated environments, avoiding the impression that patients are passive recipients of impersonal algorithms. Psychoanalytic and attachment theories provide a framework that underscores structural variability in patient experiences and supports the design of digital clinical practice as a flexible and adaptive space [11,14,15].

In summary, the results indicate that the orthodontist's physical absence does not necessarily weaken the therapeutic bond, provided that symbolic devices are coherently aligned with the patient's subjective structure. Rather than an obstacle, absence can become a clinical resource that, when symbolized appropriately, structures desire and sustains adherence. *OrtoBotAI* exemplifies how this hypothesis can be operationalized in practice, offering a model of symbolically informed teledentistry that not only transmits information but also fosters accompaniment, continuity and trust [4,18]. The modular design of *OrtoBotAI* supports integration of multiple diagnostic and therapeutic components into a single symbolic framework (Fig. 3).

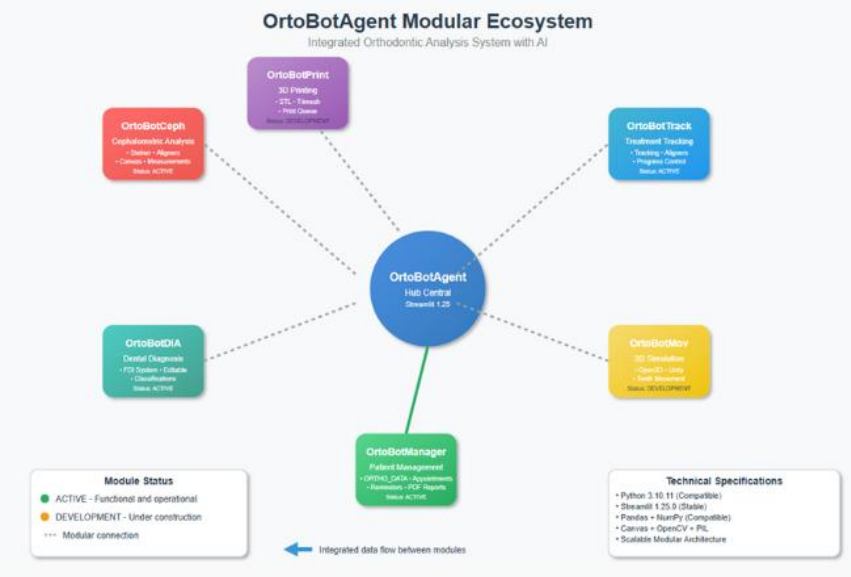

Figure 3: *OrtoBotAI* modular ecosystem. Diagram of the integrated architecture of OrtoBotAgent and associated modules (Ceph, DIA, Track, Mov, Print, Manager). Modules are distinguished by status (active vs. in development), with bidirectional data flow through the central hub.

Diagram showing the integrated architecture of OrtoBotAgent and its associated modules (Ceph, DIA, Track, Mov, Print and Manager). Modules are classified by status (active vs. in development), with bidirectional data flow managed through the central hub.

Significance Statement

This study introduces the concept of symbolic presence as a clinical resource in digital orthodontics, demonstrating that adaptive communication strategies can effectively compensate for the orthodontist's physical absence. By integrating psychoanalytic and attachment frameworks with artificial intelligence, the *OrtoBotAI* platform operationalizes subjective dimensions of care through personalized symbolic signs. Preliminary results show significant improvements in adherence, satisfaction and reduction of transferential conflicts, highlighting that digital orthodontics must be designed not only for technical precision but also for affective resonance. These findings open a new paradigm in digital healthcare where AI redistributes, rather than replaces, the symbolic function of the clinician.

Conclusion

The preliminary validation of *OrtoBotAI* shows that adaptive symbolic signs can significantly improve adherence, satisfaction and reduce transferential conflicts in digital aligner treatments. These findings suggest that symbolic strategies represent a clinically relevant complement to technical monitoring, particularly for patients with anxious or hypervigilant profiles. Although limited by sample size and short follow-up, the results highlight the need for larger controlled studies to evaluate long-term effects and generalizability across diverse populations. Ethical considerations remain central: informed consent, patient privacy and escalation protocols must accompany the design of symbolic mediation systems. Future developments should integrate *OrtoBotAI* modules into broader digital orthodontics ecosystems, testing how symbolic presence interacts with biomechanical precision to sustain therapeutic alliance in hybrid human-AI models.

Conflict of Interest

There are no conflicts of interest that may have influenced the research, authorship or publication of the article.

Financial Disclosure

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Ethical Statement

This project was exempt from IRB review as it did not qualify as human subject research under federal regulations.

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