

Article

Development and Psychometric Evaluation of a Multidimensional Model for Assessing Domains of Patient Satisfaction with Dental Services

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Featured Application

The findings support the further development of multidimensional approaches to assessing patient satisfaction with dental services based on the framework examined in the present study. Such tools may facilitate the systematic evaluation of different aspects of dental care quality, help identify areas requiring improvement, and provide a basis for research and comparative analyses of patient experiences in dental care settings.

Abstract

The study aimed to develop and preliminarily evaluate a multidimensional model and questionnaire for assessing domains of patient satisfaction with dental services in the context of Polish dental care. Analyses were based on data collected in a cross-sectional online survey conducted among 336 patients. Confirmatory factor analysis supported an eight-factor structure comprising dentist-patient communication, dentist's sensitivity to patient pain, professional competence, trust in the dentist, availability of services, dental clinic equipment, dental clinic location, and value of services. The model showed acceptable fit to the data and provided evidence of convergent and discriminant validity, with all HTMT values below the recommended threshold of 0.85. The final questionnaire comprised 32 items organised into eight four-item scales, which showed acceptable-to-high internal consistency. Structural equation modelling revealed a pattern consistent with a statistical mediation model in which general satisfaction links evaluations of specific domains of dental services with revisit intention. These findings support the usefulness of the proposed multidimensional model for assessing patient satisfaction with dental services, although further validation in independent samples is needed to confirm its temporal stability, measurement invariance, predictive validity, and generalizability.



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1. Introduction

A transition from a problem-focused approach to a patient-focused one is taking place in medical care [1]. In the latter approach, patients actively participate in the treatment process, and their needs and preferences are taken into account in the medical care process. Such an approach not only empowers the patient and promotes their health but also makes

a difference in the conditions of competition in the dental services market: increasing patient satisfaction fosters the intention to return to the clinic.

Satisfaction is the effect of a holistic evaluative judgement or the outcome of a judgement relating a specific aspect of the medical service. By its nature, it is a subjective assessment that depends not only on the objective quality of services but also on the adopted point of reference, expectations, previous experience, individual differences, and situational factors before, during, and after the visit to the dentist.

The vast majority of researchers consider patient satisfaction with medical services to be a multidimensional phenomenon [2]. However, the number of dimensions varies significantly depending on the author [3–8]. One of the most comprehensive sets of aspects of medical service provision, the assessment of which determines customer satisfaction, was included in the literature review by Batbaatar et al. [9]. The review covered eight categories related to the service provider that might account for differences in patient satisfaction: interpersonal care, technical care, physical environment, availability of services, financial value of services, organisation of care, continuity of care, and outcomes/effectiveness of care.

There are also various multidimensional questionnaires to measure different aspects of patient satisfaction in the dental field, such as the 19-item Dental Satisfaction Questionnaire (DSQ) [10], the 10-item Dental Visit Satisfaction Scale (DVSS) [11], the 22-item Scale for Measuring Consumer Perception of Service Quality (SERVQUAL) [12], or the 31-item Australian Dental Satisfaction Scale (DSS) [13]. Most of them do not exhaust all the domains of satisfaction listed above or, as in the case of DSS, have an unstable factor structure. On the other hand, a common psychometric shortcoming of the questionnaires—and, consequently, of the models they operationalize—is the lack of evidence supporting the discriminant validity of the dimensions/scales they include.

Park et al. [14] conducted an exploratory study in South Korea to systematise domains of patient satisfaction with dental services. To operationalize these domains, the authors used items from questionnaires used in previous studies of satisfaction with medical services by authors such as Bowers et al. [15], Cronin and Taylor [16], Son et al. [17] and Woodside [18]. An exploratory factor analysis identified nine factors as interrelated dimensions of satisfaction: dentist–patient communication, patient–support staff communication, professional competence of the dentist, trust in the dentist, equipment of the dental clinic, location of the dental clinic, value of services, general patient satisfaction, and intention to use the services again. All nine scales achieved high reliability indices measuring internal consistency [14].

While appreciating the taxonomic value of the empirically established classification reflecting the patient's subjective point of view, it is nevertheless worth noting that, in order to increase its homogeneity and theoretical coherence, it is necessary to exclude general patient satisfaction from this classification. This is because, rather than being a specific domain itself, general satisfaction represents the outcome of the subjective evaluation of all domains of satisfaction. There are seven of those in the nine-factor classification after this exclusion, since intention to use the services again, being the result of both specific (weighted sum) and general/holistic evaluation of the dental services provided, should also be treated as a separate variable. Therefore, from a theoretical point of view, the intention to visit the dental clinic again is not connected with the domains of satisfaction by a covariant relationship, but by a cause-and-effect relationship, while general satisfaction is a derivative of the evaluation of specific domains of satisfaction and is, in that sense, superior to them. It should be noted that the domains of satisfaction distinguished by Park et al. [14] can be divided into two broad categories. Dentist–patient communication, patient–support staff communication, dentist competence, and trust in the dentist reflect the subjective

assessment of specific aspects of the quality of the patient's interpersonal relationship with people providing medical assistance and concern, to a large extent, the psychological sphere. The remaining ones—the equipment of the dental clinic, the location of the dental clinic, and the assessment of the value (including the price) of services—concern the organisational, technical, and financial aspects of dental care, and as such they are largely positioned in the marketing sphere, important for the overall positive perception of the services provided. Based on the literature on the subject and based on the existing classifications of satisfaction domains, it is possible to identify several determinants of general satisfaction with dental services. Each determinant is briefly discussed below.

Communication. Correct communication between the doctor and the patient guarantees a better identification of expectations, correct diagnosis, and treatment improvement, which translates into the patient's involvement in the treatment process and the regularity of visits [19]. Building a positive relationship contributes to the patient's trust and a pleasant atmosphere and influences the continuation of treatment in a given clinic [20]. The ability to communicate effectively is one of the so-called soft skills of a dentist.

Sensitivity to pain. Some researchers distinguish sensitivity to the patient's pain experience [21,22] or empathy [23] as a category distinct from communication. Appropriate diagnosis and the dentist's argumentation regarding the treatment plan is a type of communication at the instrumental level. During the procedure, however, communication at the affective level prevails, with the individuals involved revealing their emotions in the communication process. In the context of patient anxiety, the importance of empathy is emphasised, including the correct interpretation of the patient's feelings and an adequate response to them in the treatment process, because most procedures are perceived negatively by patients due to possible pain [24,25].

Professional competence of the dentist. In addition to the previously discussed soft skills, excellent professional competence of medical personnel is undoubtedly important [21,23,26]. Like other medical services, dental treatment is subjectively assessed by patients also in terms of the extent to which the doctor's skills contribute to improving their health. Patients' expectations regarding the quality of treatment are increasing, and the factors that influence satisfaction include the amount and quality of information about the treatment process, staff involvement, individual approach to the patient, and the competence of doctors.

Trust in the dentist. Building trust has long been considered a fundamental determinant of the doctor–patient relationship. In dentistry, a lack of trust can be an obstacle to seeking care and can lead to greater patient anxiety, lower patient satisfaction, poorer adherence to professional advice, and a lower probability of achieving favourable treatment outcomes [27]. Ultimately, patient trust contributes to more effective dentist–patient communication. All communication must inspire trust, not a sense of threat, if the doctor–patient relationship is to be positive [28].

Availability of services. The availability of medical services is one of the determinants of healthcare assessment, especially in countries where it is limited, for example due to underfunding or systemic flaws [29–32]. Poland is still one such country. Flexibility and the ease of making an appointment create a positive first impression, especially when the dentist's help requires a quick response. Currently, there are many ways to contact a dental clinic and make an appointment. A dental clinic that actively runs social media is already a standard today. Skilfully used innovative ways of reaching potential patients can be an important element of the overall positive impression against the competition.

Equipment of the clinic. The modern patient evaluates the professionalism of services not only in terms of the doctor's interpersonal and communication skills or professional

competence. The visual and technological aspects of a given dental clinic play an undeniable role, especially modern equipment, cleanliness, and comfort in the facility [33,34].

Location. An important element in the use of medical services is the convenient location of the dental clinic, the accompanying services offered, and the characteristics of the area in which the facility is located [21,35]. The possibility of parking next to the facility reduces anxiety and tension, increases punctuality, and ensures that the patient arriving for the procedure is not additionally burdened with negative emotions or stress.

Value of services. The value of dental services includes not only the financial cost but also the time spent. The assessment is individual, subjective, and relative (i.e., carried out from the perspective of the effects of treatment). A review of studies on satisfaction with medical services indicates that in less developed countries this factor is one of its most important determinants [8,21,32,36,37].

Szabó et al. [38] suggest that future research should focus not only on the standard aspects of satisfaction but also on more complex, culturally conditioned ones, such as personal relationships, visit frequency, and schedule optimisation. It is also worth expanding the methodology to include qualitative research and an analysis of the differences between the patient's and the dentist's perspectives [39].

2. Research Objectives

The main objective of the study was to develop and conduct a preliminary psychometric evaluation of a multidimensional model of patient satisfaction with dental services based on the framework proposed by Park et al. [14]. In particular, the study aimed to examine the construct, convergent, and discriminant validity of a culturally adapted and partially reconstructed questionnaire developed for the assessment of multiple domains of patient satisfaction with dental services. Although the model proposed by Park et al. [14] served as the theoretical foundation for the present study, neither the original model nor the questionnaire operationalizing it has previously undergone comprehensive psychometric verification.

The research problem can be structured using the following detailed research questions:

Q1: Does the multidimensional model of domains of patient satisfaction with dental services show construct (Q1.1), convergent (Q1.2), and discriminant (Q1.3) validity?

Q2: Is the measurement of domains of patient satisfaction with dental services reliable?

Q3: What are the weights of individual domains of satisfaction in the general satisfaction with dental services reported by the patient?

Q4: Does general satisfaction mediate the relationships between specific domains of patient satisfaction and revisit intention?

3. Materials and Methods

3.1. Operationalization

Satisfaction with dental services was conceptualised as a multidimensional phenomenon, while the domains of patient satisfaction were conceptualised as intercorrelated constructs. The scales of the multidimensional questionnaire for measuring satisfaction with dental services by Park et al. [14], available in English, were treated as the basis for the operationalization of factors corresponding to the specific domains of patient satisfaction.

The aim of developing the measure in Polish was not to create a linguistic adaptation, which would have been useful in a study comparing the results from two different countries regardless of the possible shortcomings of the original tool. The aim was to develop a more perfect tool taking into account the specificity of Polish health care, with the previous tool—considered the best among the existing ones—treated as a starting point. For this

reason, each translated item was analysed in terms of content validity and psychometric value. Each item of the original measure was treated as a starting point for developing a better one that would be part of the Polish questionnaire and/or for improving the psychometric properties of the scale by adding a new item or modifying or removing dubious ones. The modification of the items from the questionnaire by Park et al. [14] consisted in (1) omitting or modifying the content that was not adapted to the reality of providing dental services in Poland or phrased in a way that would make it difficult for the patient to understand and respond to it (e.g., negations in the items); (2) dividing complex items into separate ones; (3) adding additional items to the existing scales in order to increase measurement reliability in the case of scales with a small number of items; (4) adding statements operationalizing a new latent variable not included in the original version of the questionnaire.

First, the scales that were of limited importance in the context of Polish health service (the Communication with Support Staff scale and the Competence of Support Staff scale) were omitted. The task of the dental assistant/hygienist in Poland is to assist the dentist and enhance the treatment by preparing the workstation. The patient does not experience direct contact with the assistant, only with the doctor performing the procedure. Therefore, the vast majority of respondents in Poland would have difficulty responding to the items included in these scales.

In the next step, two professional translators independently translated the items of the questionnaire proposed by Park et al. [14] into Polish. Discrepancies in the translation were discussed, and a common version was agreed, which was then back-translated into English by a third translator and compared with the original. Differences were discussed again, and minor corrections were made to the Polish version.

When this had been done, the content of the statements was adapted to the specifics of the Polish health service. Then, a three-person team assessed the content validity of each scale and optimised the wording of the statements so that they best operationalized a given theoretical construct and were formulated in the simplest and most understandable way for the average respondent. When reducing the scales, supplementing them with new items, or developing new scales, four indicators per construct were assumed as the minimum number. Appendix A includes all items of the modified version of the questionnaire, indicating the items that were inspired by the questionnaire designed by Park et al. [14] and by the results of the exploratory factor analysis discussed by the authors in the publication presenting the questionnaire. The questionnaire included the six domains of patient satisfaction distinguished in the exploratory factor analysis by Park et al. [14]—namely, Communication with the dentist, Dentist's professional competence, Trust in the dentist, Dental clinic equipment, Dental clinic location, and Value of services—and a new domains that were added, Dentist's sensitivity to the patient's pain and Availability of the dental clinic's services (see Appendix A, Table A1). In addition to the specific domains of satisfaction, General Satisfaction and Revisit Intention were measured separately also using scales developed in Polish based on Park et al. [14] (see Appendix A, Table A1). Both of them consisted of four items.

In total, the questionnaire contained 49 items arranged in random order. The respondent's task was to respond to each of the items using a 7-point scale from "completely disagree" to "completely agree". In addition, the questionnaire included questions about sociodemographic variables.

3.2. Sample and Research Procedure

Participants were recruited using a non-random convenience sampling method. A total of 443 individuals were invited to participate in the online survey, of whom 336 completed

the questionnaire, corresponding to a response rate of 75.8%. No additional exclusion criteria were applied. Data were collected between May and July 2024 using LimeSurvey version 5 (LimeSurvey GmbH, Hamburg, Germany). Due to the anonymous nature of the data collection process, it was not possible to send reminders to participants. Nevertheless, the response rate obtained may be considered satisfactory.

The stability (and replicability) of the factor structure depends on the error in estimating the correlation coefficient, which decreases with the increase in the sample size and with the increase in the correlation coefficient/factor loading. The sample used in the present study allows for detecting correlations $r > 0.15$ in the population with a probability of $1 - \beta \geq 0.90$. The confidence interval for the minimally acceptable factor loading of 0.50 is 95% CI (0.43, 0.56). According to the recommendation formulated by Guadagnoli and Velicer [40], a sample of over 300 respondents and a ratio of the number of variables to the number of respondents equal to 1:8 or lower allows for the stability/replication of the factor structure.

Among the respondents in the sample, 24.4% were men, 71.4% were women, and 2.1% reported other gender identities. The respondents were 19 to 59 years old, with a mean age of 27.1 years, a standard deviation of 6.71 years, and 94.0% of respondents being under 40. As far as education level is concerned, 28.6% of the respondents reported secondary education and 71.4% had higher education. One respondent in four (25.6%) had used dentist services in the past month, one in three (31.5%) had used them several months before the survey, one in five (19.3%) had been to a dentist more than half a year before the survey, and 17.3% had not been to a dentist for more than a year. The majority of respondents (70.5%) reported using the services of the same dentist in the past two years.

The study was not limited to a single dental service provider. Each participant evaluated the dentist they visited most frequently, and respondents represented different dentists/practices.

3.3. Statistical Analyses

Statistical analyses were performed using R version 4.5.2 (R Foundation for Statistical Computing, Vienna, Austria). Confirmatory factor analyses (CFA) and structural equation modelling (SEM) were conducted using robust maximum likelihood estimation (MLR). Model fit was evaluated using CFI, RMSEA, and SRMR indices, with CFI values ≥ 0.90 and RMSEA and SRMR values ≤ 0.08 indicating acceptable model fit [41]. The psychometric evaluation included the assessment of construct, convergent, and discriminant validity, internal consistency, HTMT coefficients, and comparisons of competing CFA models [42–45]. In addition, SEM analyses were performed to test the mediating role of general satisfaction in the relationships between specific satisfaction domains and revisit intention.

4. Results

4.1. Confirmatory Factor Analysis

To check whether the postulated eight-factor model fitted the collected data, we used confirmatory factor analysis. Among the model fit indices, taking into account all items of the questionnaire used in the study (see Appendix A, Table A1), only the CFI index did not reach an acceptable value: MLR $\chi^2(712) = 1473.86$, $\chi^2/df = 2.07$, RMSEA = 0.056 (90% CI [0.053, 0.060]), CFI = 0.889, TLI = 0.878, SRMR = 0.072. To improve the model and at the same time to increase the efficiency of measuring latent variables (i.e., using a smaller number of items to achieve high psychometric indices of the measurement of variables), we analysed factor loadings within each factor and selected four items with the strongest correlation with a given factor (see Table 1). The improved model achieved acceptable

threshold values of all indices of model fit to the input data: $\chi^2(436) = 853.06$, $\chi^2/df = 1.96$, RMSEA = 0.053 [95% CI (0.049, 0.063)], CFI = 0.920, TLI = 0.909, SRMR = 0.063.

Table 1. Descriptive Statistics, Factor Loadings, and Convergent Validity Coefficients.

Factor/Item	Descriptive Statistics		Confirmatory Factor Analysis			Cronbach's
	M	SD	λ	AVE	CR	α
Communication with the dentist (CO)						
CO1	5.56	1.26	0.77 *	0.71	0.91	0.90
CO3	5.97	1.12	0.84 *			
CO4	5.57	1.36	0.90 *			
CO5	5.70	1.22	0.85 *			
Dentist's sensitivity to patient pain (SN)						
SN1	5.50	1.37	0.82 *	0.70	0.90	0.90
SN3	5.56	1.32	0.87 *			
SN4	5.49	1.50	0.79 *			
SN5	5.49	1.43	0.85 *			
Professional competence (CP)						
CP1	5.86	0.99	0.80 *	0.70	0.90	0.90
CP2	5.83	1.08	0.88 *			
CP4	5.77	1.09	0.88 *			
CP5	5.73	1.08	0.79 *			
Trust in the dentist (TR)						
TR1	5.98	1.07	0.91 *	0.70	0.90	0.90
TR2	5.80	1.12	0.81 *			
TR4	5.67	1.27	0.78 *			
TR6	5.70	1.13	0.85 *			
Availability of services (AS)						
AS1	5.27	1.47	0.72 *	0.36	0.69	0.69
AS2	4.40	1.73	0.53 *			
AS3	4.91	1.59	0.51 *			
AS4	5.76	1.30	0.62 *			
Dental clinic equipment (CE)						
CE1	5.98	1.12	0.73 *	0.63	0.87	0.86
CE2	5.60	1.43	0.80 *			
CE3	6.07	1.03	0.78 *			
CE5	5.65	1.30	0.85 *			
Dental clinic location (CL)						
CL1	5.76	1.23	0.79 *	0.53	0.81	0.80
CL2	4.72	1.75	0.60 *			
CL3	4.67	1.46	0.67 *			
CL4	5.51	1.29	0.82 *			
Value of services (VS)						
VS1	6.07	1.02	0.73 *	0.62	0.87	0.86
VS2	5.46	1.40	0.77 *			
VS4	5.21	1.34	0.76 *			
VS5	5.64	1.26	0.88 *			

Note. M—mean, SD = standard deviation, λ = factor loading, AVE = average proportion of explained item variance by a factor, CR = composite reliability, α = Cronbach's internal consistency coefficient. The items of the scales in the full version are given in the Appendix A, Table A1. * $p < 0.001$.

4.2. Convergent Validity and Reliability

Descriptive statistics for the items included in the final version of the questionnaire, factor loadings, AVE indices, and reliability coefficients are presented in Table 1, while Table 2 presents correlations between factors of the tested eight-factor model. All items in the measurement model were statistically significant, AVE was higher than 0.50 for

seven out of eight factors, and generic reliability (CR) indices reached values higher than 0.70, indicating the convergent validity of the model (see Table 1). Only in the case of the factor measuring the availability of services was the AVE index (0.36) below the recommended threshold. If $AVE < 0.50$ but $CR > 0.60$, Fornell and Larcker [42] suggest that the constructs may still be acceptable, although with caution.

Table 2. Correlation Coefficients Between Factors.

	Factor	CO	SN	CP	TR	AS	CE	CL	VS
CO	Communication with the dentist	0.84							
SN	Sensitivity to patient pain	0.67	0.83						
CP	Professional competence	0.60	0.56	0.84					
TR	Trust in the dentist	0.68	0.69	0.75	0.84				
AS	Availability of services	0.42	0.32	0.39	0.38	0.60			
CE	Dental clinic equipment	0.30	0.35	0.32	0.38	0.57	0.79		
CL	Dental clinic location	0.26	0.29	0.24	0.25	0.54	0.52	0.73	
VS	Value of services	0.56	0.57	0.64	0.72	0.45	0.40	0.36	0.79

Note. The values on the diagonal are bold, which are the root of the AVE coefficients. The remaining values are correlations between factors. All coefficients are statistically significant at the level of $p < 0.001$.

In the case of seven out of eight factors (scales), both composite reliability (CR) and Cronbach's α reached values indicating a very high internal consistency of items within their scales: the coefficients ranged from 0.80 to 0.90. Considering the number of items (four) per scale, this is a very good result Schmitt [44]. A moderate level of internal consistency was observed only for the measurement of service availability ($\alpha = 0.69$).

4.3. Discriminant Validity

Next, we assessed the discriminant validity of the measurement model using both the Fornell–Larcker criterion and the heterotrait–monotrait ratio of correlations (HTMT). In all cases, the square roots of the AVE values exceeded the inter-construct correlations (Table 2), supporting discriminant validity according to the classical criterion. Furthermore, all HTMT values were below the recommended threshold of 0.85 (Table 3), ranging from 0.18 to 0.74. The highest HTMT value was observed between professional competence and trust in the dentist (HTMT = 0.74), remaining below the conservative cut-off value. Importantly, the constructs identified as potentially overlapping—including trust, professional competence, value of services, communication with the dentist, and sensitivity to patient pain—all demonstrated satisfactory discriminant validity. These findings support the adequacy of the proposed eight-factor structure and indicate that the constructs represent empirically distinct, although theoretically related, dimensions of patient satisfaction.

Table 3. Heterotrait–Monotrait Ratio (HTMT) Matrix.

	Factor	CO	SN	CP	TR	AS	CE	CL
CO	Communication with the dentist	-						
SN	Sensitivity to patient pain	0.67	-					
CP	Professional competence	0.62	0.57	-				
TR	Trust in the dentist	0.69	0.69	0.74	-			
AS	Availability of services	0.34	0.26	0.32	0.24	-		
CE	Dental clinic equipment	0.31	0.36	0.33	0.41	0.54	-	
CL	Dental clinic location	0.23	0.28	0.18	0.22	0.50	0.50	-
VS	Value of services	0.58	0.58	0.65	0.72	0.42	0.41	0.38

4.4. Testing Competing CFA Models

To further evaluate the distinctiveness of the proposed dimensions, several competing CFA models were tested, including models combining conceptually related constructs as potentially overlapping. The proposed eight-factor model demonstrated the best overall fit to the data (CFI = 0.920, RMSEA = 0.053, SRMR = 0.063) and consistently outperformed all more parsimonious alternatives (see Table 4). In particular, models combining trust with professional competence, communication with pain sensitivity and trust, or infrastructural dimensions showed substantially poorer fit indices. These findings provide additional support for the discriminant validity and structural validity of the proposed eight-factor solution.

Table 4. Comparison of Competing CFA Models.

Competing CFA Models							
Model	M1	M2	M3	M4	M5	M6	M7
χ^2	853.06	2768.57	1094.25	1442.30	1178.87	1412.31	1749.95
df	436	464	443	449	449	454	458
$p <$	0.001	0.001	0.001	0.001	0.001	0.001	0.001
CFI	0.920	0.558	0.875	0.809	0.860	0.816	0.752
TLI	0.909	0.527	0.860	0.789	0.845	0.799	0.732
RMSEA	0.053	0.122	0.066	0.081	0.070	0.079	0.092
RMSEA (Lower)	0.049	0.118	0.062	0.077	0.065	0.075	0.088
RMSEA (Upper)	0.058	0.126	0.071	0.085	0.074	0.084	0.096
SRMR	0.063	0.112	0.067	0.073	0.073	0.076	0.081
AIC	29,446.2	31,828.3	29,741.6	30,161.7	29,814.6	30,111.6	30,527.7
BIC	29,919.5	32,194.8	30,188.2	30,585.4	30,238.3	30,516.2	30,917.0
Δ AIC	0	2382.1	295.4	715.5	368.4	665.4	1081.5
Δ BIC	0	2275.3	268.7	665.9	318.8	596.7	997.5
Δ CFI	0	−0.362	−0.045	−0.111	−0.060	−0.104	−0.168
Δ RMSEA	0	0.069	0.013	0.028	0.017	0.026	0.039

Note. M1 = eight-factor model; M2 = one-factor model; M3 = seven-factor model in which professional competence (CP) and trust in the dentist (TR) were combined into a single factor; M4 = six-factor model in which communication with the dentist (CO), sensitivity to patient pain (SN), and trust in the dentist (TR) were combined into a single factor; M5 = six-factor model in which availability of services (AS), dental clinic equipment (CE), and dental clinic location (CL) were combined into a single factor; M6 = five-factor model in which professional competence (CP) and trust in the dentist (TR) were combined into one factor, and availability of services (AS), dental clinic equipment (CE), and dental clinic location (CL) were combined into another factor; M7 = four-factor model consisting of interpersonal dimension (CO, SN, and TR), competence dimension (CP), infrastructure dimension (AS, CE, and CL), and value dimension (VS).

4.5. Domains of Patient Satisfaction vs. General Satisfaction with Dental Services

In order to verify the weight of each specific domain of patient satisfaction in explaining general satisfaction with dental services, the psychometric value of the measurement of general satisfaction was tested first. A confirmatory analysis of the single-factor model indicated a very good fit of the model to the data: $\chi^2(2) = 4.55$, $p = 0.103$, $\chi^2/df = 2.28$, RMSEA = 0.014 [95% CI (0; 0.139)], CFI = 0.998, SRMR = 0.006. The scale demonstrated high composite reliability (CR = 0.96). By treating general satisfaction as the dependent variable and the eight domains of patient satisfaction as independent variables in the structural equation model ($\chi^2(558) = 1320.61$, $p < 0.001$, $\chi^2/df = 2.37$; RMSEA = 0.064 [95% CI (0.059; 0.068)], CFI = 0.916, SRMR = 0.061), we found that they explained 90% of the variance in general satisfaction ($R^2 = 0.899$).

Of all the specific domains, only the availability of services was not statistically significant, as its shared variance with the dependent variable was accounted for by the remaining predictors. The strongest predictor turned out to be the subjectively assessed price-to-value ratio of services ($\beta = 0.63$, $p < 0.001$), followed by trust in the doctor ($\beta = 0.18$, $p < 0.001$),

equipment of the dental clinic ($\beta = 0.14, p < 0.001$), subjective opinion about the dentist competence ($\beta = 0.09, p < 0.05$), his sensitivity to pain experienced by the patient ($\beta = 0.08, p < 0.05$), and perceived quality of dentist-patient communication ($\beta = 0.07, p < 0.05$).

4.6. Testing the Mediating Role of General Satisfaction

Revisit intention was measured using four items and demonstrated high composite reliability ($CR = 0.96$). To test the mediating role of general satisfaction in the relationship between specific satisfaction dimensions and revisit intention, structural equation modelling (SEM) was conducted. Two competing structural models were compared: a full mediation model and a partial mediation model. The full mediation model demonstrated good fit to the data ($\chi^2(703) = 1267.18$, $CFI = 0.933$, $RMSEA = 0.049$, $SRMR = 0.057$) and performed comparably to the partial mediation model ($\chi^2(695) = 1258.91$, $CFI = 0.933$, $RMSEA = 0.049$, $SRMR = 0.057$). The likelihood-ratio test indicated that adding direct paths from the specific satisfaction domains to revisit intention did not significantly improve model fit ($\Delta\chi^2(8) = 8.93, p = 0.348$).

To further examine the mediating role of general satisfaction, separate mediation models were estimated for each satisfaction domain using bootstrap procedures (5000 samples). Significant indirect effects were observed for all eight domains of patient satisfaction (all $p < 0.01$). The strongest standardised indirect effects were found for value of services ($\beta = 0.896$), trust in the dentist ($\beta = 0.810$), professional competence ($\beta = 0.695$), and dentist's sensitivity to patient pain ($\beta = 0.633$). Slightly weaker but still substantial indirect effects were observed for communication with the dentist ($\beta = 0.587$) and dental clinic equipment ($\beta = 0.446$), whereas the effects of availability of services ($\beta = 0.361$) and dental clinic location ($\beta = 0.244$) were comparatively smaller. The corresponding 95% bootstrap confidence intervals ranged from [0.362, 1.291] for dental clinic location to [2.047, 4.572] for value of services, and none included zero. These findings reveal a pattern consistent with the assumption that general satisfaction mediates the relationship between evaluations of specific service domains and revisit intention.

5. Discussion

The results obtained in the Polish context provide preliminary support for the validity of the multidimensional framework for assessing patient satisfaction with dental services developed and adapted in the present study on the basis of the model proposed by Park et al. [14]. The findings suggest that the identified domains of patient satisfaction represent related but empirically distinguishable aspects of dental service evaluation. The observed pattern of correlations between the dimensions is consistent with the assumption that patient satisfaction constitutes a multidimensional construct composed of interrelated interpersonal, organisational, and value-related components. The results of the discriminant validity analyses indicate that the proposed dimensions capture relatively distinct aspects of patient satisfaction with dental services.

The present findings are consistent with previous studies emphasising the multidimensional nature of patient satisfaction in healthcare settings [3,5,8,9]. Earlier research demonstrated that patient satisfaction is influenced not only by technical aspects of care, but also by interpersonal communication, organisational efficiency, trust, and perceived quality of services [4,5,7]. The identified domains of satisfaction are also consistent with recent findings reported by Levin et al. [46], which highlighted the importance of communication, trust, interpersonal sensitivity, perceived quality of care, organisational efficiency, and value-related aspects in shaping positive patient experiences in dental services.

The present findings are also broadly consistent with earlier instruments developed for assessing satisfaction with dental services. DSQ proposed by Davies and Ware [10]

emphasised dimensions related to quality of care, accessibility, cost, and pain management, whereas the DVSS developed by Corah et al. [11] focused mainly on the interpersonal and emotional aspects of dental visits. Similarly, SERVQUAL-based approaches [12] highlighted the importance of responsiveness, reliability, and tangibility of healthcare services, while the Australian DSS [13] included organisational and technical aspects of dental care. Compared with these instruments, the present model provides a more differentiated representation of patient satisfaction by distinguishing eight related but empirically separable domains within one multidimensional framework.

The inclusion of dentist's sensitivity to patient pain appears particularly important in the context of dental care. Unlike the procedural pain-management approach used in earlier questionnaires such as the DSQ [10], the present dimension conceptualises pain-related satisfaction in interpersonal terms, emphasising empathy, compassion, and sensitivity to the patient's pain experience. The results suggest that patients may perceive sensitivity to pain as a relatively distinct aspect of dental care evaluation, closely related to communication and trust, but nevertheless empirically distinguishable from them.

The SEM analyses supported a statistical mediation model suggesting that general satisfaction may be involved in the relationship between evaluations of specific aspects of dental services and revisit intention. This pattern is consistent with theoretical approaches assuming that evaluations of specific service domains contribute to a more global assessment, which subsequently influences behavioural intentions [14,18]. At the same time, these findings should be interpreted cautiously because the present study was based on cross-sectional data. Consequently, the observed associations cannot be interpreted as evidence of causal relationships. Longitudinal studies are needed to verify the temporal ordering of these variables.

In addition to drawing on the multidimensional framework originally proposed by Park et al. [14], the present study contributes to the development and preliminary psychometric evaluation of a culturally adapted and partially reconstructed questionnaire for assessing satisfaction with dental services. The modified instrument differs from the original framework through the removal of staff-related dimensions, the introduction of a new dimension related to dentist's sensitivity to patient pain, and substantial revision and shortening of the item pool.

After reducing each scale to four items with the highest discriminating power, the 32-item instrument demonstrated satisfactory psychometric properties, including convergent and discriminant validity as well as high internal consistency. The findings suggest that the proposed multidimensional structure may provide a useful framework for assessing different aspects of patient satisfaction with dental services.

The results additionally indicate that the measured domains can be broadly grouped into interpersonal and organisational aspects of dental service evaluation. The first group includes factors related to doctor–patient interactions, whereas the second encompasses organisational, technical, and financial aspects of dental care. This distinction is reflected in the pattern of correlations observed between the factors.

Nevertheless, the present findings should be treated as preliminary evidence supporting the validity and reliability of the multidimensional model and questionnaire developed on the basis of previous research. An important limitation is that the final 32-item structure was derived and tested in the same sample. Accordingly, further research is needed to replicate the factor structure and psychometric properties of the questionnaire in independent samples to establish its robustness and generalizability. Future studies should further investigate its temporal stability, measurement invariance across different populations and cultural contexts, as well as its applicability across various modes of administration and score interpretation.

Although the Availability of Services domain met the minimum acceptable criteria for composite reliability and internal consistency, its psychometric parameters were weaker than those observed for the other domains. Therefore, further refinement of this domain and replication of its measurement properties in independent samples are warranted.

Due to the use of a non-random convenience sample, caution is warranted when generalising the findings. In particular, the results may not fully extend to older patients, individuals with lower levels of education, and rural populations.

Longitudinal studies are also needed to verify the causal relationships between specific satisfaction domains, general satisfaction, and revisit intention. In addition, future studies could compare the predictive validity of the proposed framework with other existing instruments for assessing patient satisfaction with dental services and evaluate its usefulness in monitoring patient experiences across different types of dental clinics and healthcare systems.

6. Conclusions

Building on the framework originally proposed by Park et al. [14], the present study developed and preliminarily evaluated a culturally adapted and partially reconstructed multidimensional model and questionnaire for assessing domains of patient satisfaction with dental services. The findings indicate that patient satisfaction with dental services can be described by eight related but empirically distinguishable domains: communication with the dentist, sensitivity to patient pain, professional competence, trust in the dentist, availability of services, dental clinic equipment, dental clinic location, and value of services. The proposed multidimensional model demonstrated satisfactory psychometric properties, including construct, convergent, and discriminant validity, as well as acceptable-to-high internal consistency of the scales. The SEM results were also consistent with a statistical mediation model in which general satisfaction links evaluations of specific service domains with revisit intention. Overall, the developed questionnaire may provide a useful basis for monitoring different aspects of patient satisfaction in dental care settings and for future comparative studies. However, further research is needed to confirm its temporal stability, measurement invariance, predictive validity, and applicability across different populations and modes of administration.

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Abbreviations

The following abbreviations are used in this manuscript:

CO	Communication with the dentist
SN	Dentist's sensitivity to patient pain
CP	Dentist's professional competence
TR	Trust in the dentist
AS	Availability of the dental clinic's services
CE	Dental clinic equipment
CL	Dental clinic location
VS	Value of service
GS	General satisfaction with services
IR	Intention to revisit

Appendix A

Table A1. Questionnaire used in the research.

Abbr	Scale and Items
CO	Communication with the dentist
CO1	• The dentist listens carefully to what I have to say. *
CO2	• The dentist explains the details of the treatment (including diagnosis, procedure, and the use of prescription medication). *
CO3	• The dentist is nice and polite during the visit. *
CO4	• The dentist creates an atmosphere in which I can talk freely. *
CO5	• The dentist answers my questions in a simple and understandable way. *
SN	Dentist's sensitivity to patient pain
SN1	• When I experience acute pain, the dentist stops the procedure in time.
SN2	• The dentist is able to recognize the moment when the pain during the procedure is the strongest.
SN3	• The dentist shows empathy for my pain sensations during the procedure.
SN4	• The dentist warns me before performing a procedure that causes pain.
SN5	• The dentist makes sure that he or she does not cause me excessive pain during the procedure.
SN6	• The dentist shows compassion throughout the procedure.
CP	Dentist's professional competence
CP1	• In my opinion, the dentist is knowledgeable about the process of my treatment. *
CP2	• I believe that the dentist performs the procedures well.
CP3	• I believe that the dentist precisely administers anaesthesia to me.
CP4	• In my opinion, the diagnosis and treatment process were performed correctly.
CP5	• The dentist perfectly understands what my ailments are. *
TR	Trust in the dentist
TR1	• My dentist is trustworthy. *
TR2	• I feel calm about the effect when I use the services of my dentist.
TR3	• I feel relieved when I can receive medical help from my dentist. *
TR4	• The dentist approaches the process of my treatment individually.
TR5	• During dental treatment, the dentist treats me like someone close to him/her.
TR6	• The dentist inspires my trust.
AS	Availability of the dental clinic's services
AS1	• The dental clinic is very flexible when I need to change the appointment date.
AS2	• The waiting time for a visit in this dental clinic is short. *
AS3	• The procedure starts at the scheduled time without unnecessary delay/waiting.
AS4	• Telephone registration in this dental clinic works efficiently.

Table A1. Cont.

Abbr	Scale and Items
CE	Dental clinic equipment
CE1	• The dental clinic is equipped with modern equipment. *
CE2	• This dental clinic has a comfortable waiting room. *
CE3	• The dental clinic is well-kept and smells fresh.
CE4	• The dental clinic is located in a nice area.
CE5	• The waiting room decor is at a good level. *
CL	Dental clinic location
CL1	• The location of the dental clinic is convenient. *
CL2	• Finding a parking space next to the dental clinic is easy.
CL3	• This dental clinic is more conveniently located than other dental clinics. *
CL4	• Access to this dental clinic is convenient. *
VS	Value of services
VS1	• The level of care I received was worth my time. *
VS2	• The medical care I received was adequate to its price.
VS3	• The cost of dental services at this dental clinic is low. *
VS4	• The cost of the services seems to be appropriate for their quality. *
VS5	• I believe that choosing this dental clinic was a good decision, considering the results of the procedure and its cost. *
GS	General satisfaction with services
GS1	• I am satisfied with the choice of this dental clinic. *
GS2	• I am satisfied with the dental services provided by my dentist. *
GS3	• I believe that this dental clinic meets my expectations. *
GS4	• I am willing to recommend this dentist to others. *
IR	Intention to revisit
IR1	• I am willing to continue treatment at this dental clinic. *
IR2	• The next time I need dental care, I will return to this dental clinic. *
IR3	• I am willing to continue treatment with this dentist. *
IR4	• Unless something extraordinary happens, I will continue to use this dental clinic. *

Note. The items listed in the table are grouped into scales. In the study, they were used in random order. * Items inspired by the questionnaire published by Park et al. [14].

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