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Original Research Article

An Exploratory Analysis of Paired Customer Satisfaction Scores for Sports Massage Services Accessed Through an Android Application

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Abstract

Sports massage services accessed through mobile applications combine a physical service encounter with a digital customer experience. Evaluating satisfaction requires clear measurement and consistent records. This study examined paired satisfaction scores reported for users of an Android-based sports massage service and assessed sensitivity to conflicting baseline transcriptions. An exploratory secondary analysis was conducted on two tables, each containing 30 paired records. The tables shared identical follow-up scores but differed in three baseline values; they were analyzed separately rather than pooled. In version A, the mean increased from 94.20 to 97.87, with a mean difference of 3.67 score units and a 95% confidence interval of 2.25 to 5.08. In version B, the mean increased from 93.77 to 97.87, with a difference of 4.10 units and a 95% confidence interval of 2.49 to 5.71. Exploratory paired t tests and Wilcoxon signed-rank checks indicated the same direction of change in both versions, with all p-values below .001. Nevertheless, the narrative sample size of 18 could not be reconciled with the 30 tabulated records, and the scoring range, assessment timing, and service-quality item responses were unavailable. These findings reflect an arithmetic pattern in the supplied records rather than a verified effect of service quality. The study supports clearer separation of customer satisfaction, digital usability, interpersonal service quality, and recovery outcomes in future evaluations. Reconciliation with the original questionnaires and recruitment register is necessary before drawing stronger empirical conclusions.

Keywords: Android applications; customer satisfaction; digital service quality; sports massage; user experience

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1. INTRODUCTION

Sports massage services involve more than delivering a physical technique. Customers also encounter appointment arrangements, provider information, pre- and during-session communication, payment procedures, and opportunities to raise concerns. When these activities

are coordinated through a mobile application, customers evaluate both a digital interface and a person-delivered service. A smooth booking experience may coexist with an unsatisfactory massage encounter, while a positive interpersonal experience may coexist with application problems. Treating these experiences as a single, undifferentiated score can obscure which aspect of service needs improvement.

Recent fitness-service research provides a useful starting point. Researchers have examined perceived facilities, employee-related quality, engagement, and experiential quality in relation to satisfaction and other customer outcomes (Gálvez-Ruiz et al., 2023; Sevilmiş et al., 2024). Research on Turkish fitness clubs also situates customers' psychological evaluations within sporting service management (Şirin et al., 2025). These studies support evaluating the service encounter from the user's perspective. However, their constructs and findings cannot be directly transferred to app-mediated massage, where privacy, physical contact, recovery expectations, and assessment timing may matter differently.

Massage-related expectations also require care. A recent systematic review reports that massage effects differ across motor, physiological, and psychological outcomes, with limited support for general improvements in sporting performance (Dakić et al., 2023). Another review describes mixed results across recovery and performance measures (Gasibat et al., 2024). An umbrella review in endurance athletes likewise finds no recovery strategy with consistent benefits across all examined circumstances (Li et al., 2024). Customer satisfaction is therefore an important experience measure, but it does not show that massage improves athletic performance, accelerates physiological recovery, or treats an underlying condition.

Digital-service research adds further distinctions. Analysis of mobile-health user reviews identifies convenience, availability, responsiveness, time, and cost as relevant aspects of the user experience (Pal et al., 2023). Mobile consultation research separates evaluations of informational support and interpersonal support (Liu et al., 2023). Other work identifies assurance, efficiency, reliability, and content as relevant to continued use of mobile-health services (Alzahrani et al., 2022). These findings suggest that booking an appointment, understanding a service, receiving respectful attention, and deciding to use an application again should be measured separately when the research question requires that distinction.

The relationship between customer experience and future behavior is also complex. Researchers have examined satisfaction and trust alongside loyalty and responses to service prices in fitness settings (Tamayo-Fajardo et al., 2025). Research on mobile-health platforms distinguishes initial use from continued use and examines how satisfaction operates within platform-specific arrangements (Lu et al., 2025). Neither repeat purchase nor continued application use can be inferred from a satisfaction score alone. This matters for sports massage businesses because an immediately favorable assessment may not indicate whether customers return, recommend the provider, or experience a sustained benefit.

Evaluation requires precise descriptions of the technology as well as the service. The World Health Organization's digital-intervention classification offers a shared vocabulary for distinguishing digital functions and service types (World Health Organization, 2023). It does not make every booking application a clinical intervention. At a policy level, Indonesia's sports framework and human-development agenda provide a context for improving the quality and organization of sporting services (Ministry of State Secretariat of the Republic of Indonesia, 2025; Republic of Indonesia, 2022a). The Sustainable Development Goals provide a broader rationale for accessible, accountable services but offer no direct evidence of the effectiveness of an individual application or massage provider (United Nations, 2024).

The source study investigated sports massage service quality and customer satisfaction among users of an Android-based application. It described five service-quality domains—tangibles, reliability, responsiveness, assurance, and empathy—but presented inconsistent sample descriptions and two alternative paired-score tables. Because a quality–satisfaction

association cannot be estimated without corresponding quality measurements, the present analysis addresses a narrower question: what pattern is present in the tabulated satisfaction scores, and how sensitive is that pattern to the conflicting baseline entries? This focus preserves the available observations while preventing an unsupported claim about the influence of service quality.

2. METHOD

2.1 Participants and Analytic Records

The analysis used records labeled as customer satisfaction assessments for users of an Android-based sports massage service. The narrative described 18 respondents, whereas each of the two attached tables contained 30 rows with paired scores. Both tables used the same sequence of customer labels and identical follow-up values. They were consequently treated as alternative transcriptions of one candidate dataset, not as independent samples or two additional groups. The analytic count of 30 refers to tabulated paired records; the number of uniquely recruited and eligible customers remains unverified.

Age, sex distribution, sporting background, service location, recruitment dates, and eligibility criteria were not established in the supplied record. The sampling process was described only as adjusted to inclusion criteria, without stating those criteria or a reproducible recruitment procedure. The analysis therefore does not characterize the customers as competitive athletes, assign a demographic profile, or assume a particular service setting from the authors' institutional affiliation. Customer names were replaced with neutral record numbers for reporting.

2.2 Research Design

An exploratory secondary analysis of paired score records was undertaken. The two occasions were retained as baseline and follow-up because the tables used pretest and posttest labels. The interval between occasions and their relationship to a particular service encounter were not documented. No randomized allocation, comparison group, controlled service-quality intervention, or treatment schedule was identifiable. Accordingly, the design supports conditional comparison of the recorded scores, rather than causal estimation of the effect of either an application or a massage service.

The available evidence consisted of numerical tables and accompanying study descriptions. Original questionnaires, a recruitment register, application logs, and a verified analysis file were unavailable. The source's narrative means of 4.50 and 5.61, and its reported t statistic of 3.249, could not be reconciled with either paired table. The authors did not combine these values with the tabulated scores, rescale them to match, or use them to determine which transcription was correct.

2.3 Instruments and Constructs

The source described Likert-type questionnaires addressing service quality and satisfaction. Its proposed quality framework covered tangibles, reliability, responsiveness, assurance, and empathy. It also mentioned comfort, the fit between expectations and experience, and intentions to reuse the application. However, item wording, item count, response anchors, reverse scoring, possible total-score range, and the rule for constructing the tabulated totals were not supplied. Although instrument testing was mentioned, no validity coefficients or reliability estimates were available for verification.

The numerical outcome is therefore reported as a recorded satisfaction score in unspecified score units. A score of 98 is not interpreted as 98% satisfaction, and no label such as satisfied, very satisfied, or clinically improved is assigned. The narrow follow-up range is described directly without assuming a maximum possible score. Likewise, references to five

quality domains do not establish that expectation–perception gap scores were calculated. Such a claim would require matched expectation and perception items and a documented scoring procedure.

This distinction matters for the current literature. A recent Indonesian sports massage study explicitly measured perceptions and expectations across five quality domains (Mulyono et al., 2026). By contrast, the current tables contain only two satisfaction-score columns. Broader eHealth evaluation research also distinguishes technical, social, and organizational criteria rather than treating them as interchangeable aspects of a single favorable rating (Jacob et al., 2023). These sources guide interpretation of the constructs; they do not validate the unavailable questionnaire used in the source study.

2.4 Procedures and Data Preparation

The first paired table was designated version A and the second version B. Scores were transcribed by row position. Embedded spaces between digits were removed where the numeric value was unambiguous, such as 8 0 becoming 80. The final row was assigned analytic record number 30 even though its printed sequence label was 39. No score was imputed, averaged across versions, or replaced on the basis of a preferred statistical result. Table 1 identifies the three conflicting baseline entries.

All follow-up values matched across versions. The three baseline disagreements occurred at records 01, 08, and 30. Because the original questionnaires were unavailable, we did not designate either version as the authoritative dataset. Each version was processed independently using identical analysis rules. Row alignment is conditional on the ordering in the source tables and has not been independently confirmed against participant identifiers or assessment timestamps.

Table 1.

Discrepant baseline entries in the two source transcriptions

Analytic record	Version A	Version B	Follow-up
01	87	80	97
08	92	90	98
30	99	95	98

Note. Record numbers refer to row position and replace source names. The printed sequence number for the final source row was 39. All other baseline values and all 30 follow-up values match across versions. Neither version has been authenticated against original questionnaires.

2.5 Ethical Considerations

The supplied materials did not document an ethics-review decision, informed-consent procedure, or authorization for secondary publication of customer-level records. No approval identifier or retrospective claim of consent is therefore asserted. Direct identifiers were omitted from this article, and only aggregate results and neutral discrepancy record numbers are presented. This reporting step does not establish that the original collection or subsequent use met all applicable ethical requirements.

Indonesia's personal-data protection framework is relevant to identifiable customer and health-related information (Republic of Indonesia, 2022b). Operationally, collecting feedback should distinguish consent to receive a service from agreement to participate in research or to have identifiable information published. The World Health Organization's implementation guidance similarly places governance, information protection, and documented service

procedures within responsible digital-service implementation (World Health Organization, 2022). These principles inform the research implications; they are not a statement that compliance was verified in the source study.

2.6 Data Analysis

For each version, the paired difference was defined as follow-up minus baseline. Analyses included the mean, sample standard deviation, median, observed range, mean paired difference, and counts of positive, zero, and negative changes. A 95% confidence interval for the mean difference was calculated from its standard error and the t distribution with 29 degrees of freedom. Standardized paired change was calculated as the mean difference divided by the sample standard deviation of the differences, denoted d_z. This quantity describes within-record change, not an intervention-versus-control effect.

Exploratory paired t tests used a two-sided significance level of .05. Because the differences were discrete, included ties, and showed nonnormality in Shapiro–Wilk checks, Wilcoxon signed-rank tests were also calculated. Zero differences were excluded, tied absolute differences received average ranks, and two-sided p-values used the normal approximation with tie correction and no continuity correction. These tests were sensitivity checks on the supplied numerical records. Their assumptions do not resolve the source's uncertainties about participant identity, chronology, or measurement.

No regression coefficient, quality–satisfaction correlation, domain-specific effect, mediation model, or ranking of service-quality dimensions was estimated. Those analyses require measurements not present in the tables. No basis existed for an independent-samples comparison because the two transcriptions share the same follow-up records and represent alternative versions rather than separate experimental groups. Calculations used Python 3.12.14, NumPy 2.3.5, and SciPy 1.17.0. All findings are presented as exploratory and conditional on the validity of the tabulated paired-score structure.

3. RESULTS

3.1 Consistency of the Source Records

Each table contained 30 complete numeric pairs. Version B had lower baseline values in three rows; all other baseline entries and all follow-up scores matched version A. The baseline discrepancy changed the mean by 0.43 units. The narrative sample count of 18 and its separate low-valued score summaries did not identify which table, if either, represented the intended final dataset. Consequently, the results below describe both candidate transcriptions without treating their agreement as independent replication.

3.2 Descriptive Comparison of the Two Occasions

The descriptive results are presented in Table 2. Both versions showed higher follow-up means and substantially less dispersion. Follow-up scores occupied only three observed values: 97, 98, and 99. This concentration describes the recorded distribution; it does not establish the questionnaire's upper limit or discrimination. Increases occurred in 23 records in version A and 24 in version B, while four records were unchanged in both versions. Thus, an increase in the overall mean did not represent improvement in every record.

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Table 2.

Descriptive satisfaction scores under alternative transcriptions

Measure	Version A	Version B
Paired numeric records	30	30
Baseline mean (SD)	94.20 (4.01)	93.77 (4.55)
Follow-up mean (SD)	97.87 (0.63)	97.87 (0.63)
Baseline median	95.00	94.50
Follow-up median	98.00	98.00
Baseline observed range	87–99	80–98
Follow-up observed range	97–99	97–99
Positive change, n (%)	23 (76.7)	24 (80.0)
Unchanged, n (%)	4 (13.3)	4 (13.3)
Negative change, n (%)	3 (10.0)	2 (6.7)

Note. SD = sample standard deviation. Versions A and B are alternative transcriptions of the same candidate records; they must not be pooled as 60 observations. Values are unspecified score units, not satisfaction percentages or percentage points. The narrative count of 18 respondents remains unresolved.

3.3 Exploratory Paired Comparisons

Table 3 shows the numerical comparisons calculated separately for each transcription. Both confidence intervals excluded zero, and the paired t tests and signed-rank sensitivity checks indicated the same positive direction. Shapiro–Wilk p-values for the paired differences were .007 in version A and .005 in version B, supporting cautious interpretation of the parametric comparisons. Agreement between two statistical methods reduces concern that the direction is attributable solely to the paired t formulation. It does not authenticate either dataset or establish why the scores differed.

Table 3.

Exploratory paired comparisons and sensitivity checks

Statistic	Version A	Version B
Mean paired difference	3.67	4.10
SD of paired differences	3.78	4.31
95% CI for mean difference	2.25–5.08	2.49–5.71
Paired t statistic, df = 29	5.311	5.210
Two-sided paired t p-value	< .001	< .001
Standardized paired change	0.97	0.95
Wilcoxon signed-rank W	13.5	8.0
Two-sided Wilcoxon p-value	< .001	< .001
Nonzero differences	26	26

Note. CI = confidence interval; df = degrees of freedom. Change is follow-up minus baseline. Standardized change is d_z = mean change / SD of changes. Wilcoxon tests excluded zero differences and used average ranks for ties with a normal approximation, tie correction, and no continuity correction. All comparisons are exploratory and conditional on valid pairing and measurement in the source records.

Service-quality item responses, expectation scores, application usability measures, recovery outcomes, repeat bookings, and longer-term assessments were not available. The analysis therefore provides no numerical estimate of the relationship between service quality and satisfaction and no evidence of physiological or sporting benefit.

4. DISCUSSIONS

4.1 Meaning of the Recorded Satisfaction Pattern

Both alternative transcriptions show a higher mean at the occasion labeled follow-up. The change remains positive after the three conflicting baseline entries are considered, which makes the arithmetic direction less sensitive to those particular discrepancies. Nevertheless, the study's central uncertainty is not whether a statistical test detects a difference within the tables. It is whether those tables represent the intended customers, occasions, and scoring system. Statistical consistency cannot substitute for confirmation of the underlying observations.

The estimated changes of 3.67 and 4.10 units should therefore be interpreted on the source's unspecified numerical scale. Without the questionnaire range, item composition, measurement error, or a meaningful-change threshold, their practical importance cannot be established. The standardized paired changes also require restraint: they express change relative to the variation in paired differences and do not show an advantage over another service provider, a conventional booking method, or an untreated group.

The follow-up concentration warrants particular attention. Restricted dispersion can make a total score less useful for distinguishing customers with different experiences. Possible explanations include a genuinely similar experience, insensitive items, socially desirable

responses, scoring conventions, or transcription practices. None was measured in this study. A proper measurement review would inspect item distributions, missing responses, coding rules, and the relationship between total scores and independently documented service experiences before assigning a quality label.

4.2 Separating Interpersonal Service Quality from Digital Experience

The original quality–satisfaction question remains worth investigating, but it requires separate operational measures. Fitness research shows that interaction quality, the physical setting, and perceived outcomes can contribute differently to the overall experience (Kim & Kim, 2024; Sevilmiş et al., 2024). Research in Spanish fitness centres similarly examines employee-related quality, facilities, and customer engagement as distinct constructs (Gálvez-Ruiz et al., 2023). For massage services, plausible corresponding domains include appointment reliability, clear explanation, respectful interaction, privacy during the encounter, and the suitability of the service environment. These are candidate measurement domains, not findings about the provider examined here.

The digital layer adds tasks that may occur before and after physical service delivery. A review of mobile-app usability evaluation identifies the need for domain-appropriate evaluation criteria (Galavi et al., 2024). A scoping review also describes usability, adherence, privacy, skills, implementation, and cost as separate sources of difficulty in digital health (Giebel et al., 2023). In app-mediated massage, a customer might be satisfied with the provider but dissatisfied with confirmation messages, price information, cancellation rules, or problem resolution. An overall score cannot identify which of these experiences produced the rating.

Communication links the layers. Mobile consultation research indicates that informational and emotional support can relate differently to users' evaluations (Liu et al., 2023). An Emerald study of mobile-health service quality also examines provider effort, listening, expertise, credibility, and rapport (Lee & Shin, 2025). These findings support studying communication and professional interaction explicitly. However, remote medical consultation and in-person massage involve different forms of contact, service expectations, and professional responsibilities, so direct equivalence should not be assumed.

Digital transformation itself is not a sufficient quality indicator. A review of Health care 4.0 examines how technology relates to service quality (Sony et al., 2023), while a broader telemedicine review distinguishes several quality domains (Kruse et al., 2023). The relevant implication is to specify which part of the customer journey the technology changes. Because application functions were not documented in the source study, Android identifies an operating-system context rather than an evaluated service innovation.

4.3 Satisfaction, Trust, and Continued Use

Trust is related to satisfaction but should not be absorbed into it. A systematic review describes trust in digital healthcare as a heterogeneous and relational construct, with frequent limitations in how it is measured (Catapan, Sazon, et al., 2025). A mixed-methods study further shows the value of investigating users' own preferences and concerns when seeking to improve trust (Catapan, Taylor, et al., 2025). For sports massage, trust may concern the service provider, the organization coordinating it, and how the application handles information. These referents require clear wording if their respective contributions are to be tested.

Privacy may also affect whether customers remain willing to engage. Research on mobile-health applications links privacy concerns, perceived control, and engagement (Zheng et al., 2024). More recent information-systems research specifically investigates discontinuous disclosure in mobile-health contexts (Wintmölle et al., 2026). These findings make a brief privacy statement an insufficient proxy for user trust. Future sports-service evaluations should examine whether customers understand what information is collected, why it is needed, and

what choices they have, without assuming that overall satisfaction reflects confidence in information handling.

Continued use is another distinct outcome. Research that translates mobile-health feedback into measurable service attributes shows how to prioritize satisfaction-related requirements (Fu et al., 2023). Work on continued mHealth use likewise distinguishes quality-related factors associated with users' intentions (Alzahrani et al., 2022). In fitness services, researchers have modeled trust, satisfaction, loyalty, and price adaptation separately (Tamayo-Fajardo et al., 2025). These studies support a research model with distinct constructs, rather than a conclusion that customers will return simply because the recorded mean increased.

Behavioral evidence would strengthen the interpretation. A systematic review of mHealth engagement documents substantial variation in how engagement is defined and assessed (Eaton et al., 2024). For an appointment-based sports service, independently recorded rebooking, completed appointments, cancellations, complaints, and follow-up feedback would provide different information from a one-time favorable response. Linking these records to research questionnaires would require appropriate authorization and data protection. None of these behaviors was measured in the present analysis.

4.4 Implications for Sports Massage Management

Managers can use customer feedback to identify service problems, but should avoid treating satisfaction as a recovery test. The massage literature offers mixed findings on flexibility, perceived discomfort, fatigue, and sporting performance (Dakić et al., 2023; Gasibat et al., 2024). Evidence in endurance athletes also illustrates that recovery claims depend on the population, outcome, and assessment period (Li et al., 2024). A customer may appreciate courtesy and comfort without experiencing a measurable performance benefit. Conversely, a service could produce a desired short-term experience while leaving booking or privacy problems unresolved.

A recent Indonesian SERVQUAL study offers a useful contextual comparison because it reports expectation and perception measurements explicitly (Mulyono et al., 2026). Its design supports discussing quality gaps in a way that the present paired satisfaction totals do not. The practical lesson is to maintain a clear connection between the management question and the information collected. If reliability is the concern, appointment accuracy, service consistency, and well-worded reliability items are more informative than an unexplained change in a global score.

The broader user-experience literature also identifies convenience, availability, responsiveness, and cost as relevant service-design considerations (Pal et al., 2023). A future evaluation could combine a short, clearly validated satisfaction measure with separate measures of these attributes, and then examine their associations using a sample size justified for the intended analysis. Interview or open-response material could clarify why customers gave particular ratings. Such additions would serve a specific explanatory purpose rather than simply enlarging the questionnaire.

Responsible service development also includes governance. WHO guidance emphasizes explicit planning, operating procedures, evaluation, and information protection in digital-service implementation (World Health Organization, 2022). Its classification framework reinforces the value of describing digital functions precisely (World Health Organization, 2023). These principles can inform app-mediated sporting services, while recognizing that a sports massage booking service is not automatically a telemedicine intervention. National sporting development and human-development priorities provide context for quality improvement, not evidence that this particular application has achieved a public-policy objective (Ministry of State Secretariat of the Republic of Indonesia, 2025; Republic of Indonesia, 2022a).

4.5 Limitations and Future Research

The main limitation is unresolved source consistency. The discrepancy between 18 described respondents and 30 tabulated pairs prevents a verified sample description. Conflicting baseline values remain unresolved, and the identical follow-up columns do not establish assessment chronology or participant identity. The questionnaire, recruitment register, service protocol, and original analysis file were unavailable. Missing information on sampling, timing, ethical review, and consent further limits reproducibility and generalization. The present analysis should consequently be understood as an exploratory account of supplied numerical records.

Measurement is a separate limitation. The scoring range, item content, reliability, validity, and meaning of a change were not established. Reviews of eHealth evaluation emphasize that technical quality, social experience, organizational context, and outcomes need not move together (Jacob et al., 2023). Future work should publish the instrument and scoring procedure, justify any adaptation to sports massage, distinguish perceived quality from satisfaction, and report item-level measurement evidence. A broad claim that an instrument was tested is insufficient without the relevant results.

The next empirical step is to reconcile the tables with original questionnaires and document the actual customer cohort. A prospective design could then assess expectations before a clearly specified encounter, experience after it, and rebooking or later satisfaction at a defined interval. Distinct measures could address interpersonal quality, application usability, trust, satisfaction, and recovery outcomes when relevant. A controlled design would be needed for a causal claim about a service improvement. Transparent reporting and appropriately protected data would support credible learning across sports-service settings without claiming benefits that were not measured.

5. CONCLUSIONS

The two supplied paired-score transcriptions show the same direction of change, with higher means at the occasion labeled follow-up. The estimated increase ranges from 3.67 to 4.10 unspecified score units, depending on the baseline transcription. This pattern is an exploratory finding within the records and does not establish a causal effect of sports massage service quality, application quality, or massage treatment. The contribution is to clarify the numerical result and the measurement distinctions needed for a defensible evaluation. Original-data reconciliation and a documented assessment protocol are necessary before the findings can support stronger empirical or managerial conclusions.

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