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Predictive Modelling of Employee Job Satisfaction from Transformational Leadership and Work Motivation in Primary Healthcare

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Abstract **Job satisfaction among primary healthcare staff is shaped by leadership style and workforce motivation, yet most evidence on transformational leadership in healthcare comes from hospitals rather than primary care, and few studies quantify how much of its association with satisfaction is carried through motivation. Objective: this cross-sectional study modelled the associations among transformational leadership, work motivation and employee job satisfaction at a single Indonesian primary healthcare centre, and tested work motivation as a mediating pathway. Methods: all 42 staff at Gunung Kembang Public Health Centre, Bengkulu Province, completed adapted Multifactor Leadership Questionnaire, Manifest Needs Questionnaire and Job Satisfaction Survey instruments in March 2026. Partial least squares path modelling was used, with bootstrapping (5,000 subsamples) for significance testing and a post hoc power analysis. Results: transformational leadership was positively associated with work motivation (β = 0.811, p < .001) and, to a smaller extent, directly with job satisfaction (β = 0.440, p = .003); work motivation was positively associated with job satisfaction (β = 0.475, p = .001). The indirect association through motivation (β = 0.385, p = .003) accounted for an estimated 47 per cent of the total association, consistent with partial mediation. The model explained 65.7 per cent of the variance in motivation and 75.8 per cent in satisfaction. A full-collinearity check yielded variance inflation factors of 3.5 to 4.0, indicating common method variance cannot be ruled out. Conclusion: In this small, single-centre sample, transformational leadership and work motivation were strongly and positively associated with job satisfaction, with motivation carrying a substantial share of the leadership association. Findings are associational, not causal, and require replication in larger, multi-centre and longitudinal samples before informing workforce policy.**

Keywords **Transformational leadership; Work motivation; Employee job satisfaction; Primary healthcare centre; Partial least squares path modelling.**

I. Introduction

Primary healthcare centres deliver the first level of promotive, preventive and curative services in Indonesia, and their capacity depends heavily on the workforce that provides those services. Absenteeism, weak motivation and low job satisfaction can reduce service continuity and increase the burden on attending staff. Evidence from primary care workforces in Greece, Somaliland and Ethiopia indicates that job satisfaction is shaped by supervision, recognition and working conditions, not by remuneration alone [1]–[3]. Leadership is therefore a central management factor because it influences how work is organised, how employee contributions are recognised and how staff are supported [4], [5].

Transformational leadership is particularly relevant to this problem because its four core behavioursidealised influence, inspirational motivation, intellectual stimulation and individualised considerationare intended to align individual effort with shared organisational goals [6]. Meta-analytic and empirical evidence links leadership quality with employee motivation, satisfaction and performance [7], [8], [9]. Healthcare studies further associate transformational leadership with organisational commitment, job satisfaction, personal mastery, work wellbeing, retention and quality-related outcomes [10], [9], [11], [12], [13], [14], [15]. However, most of this evidence comes from hospitals, nursing units or other large organisations, where specialised roles and multiple supervisory levels differ from the small, closely connected teams found in primary healthcare centres.

Work motivation provides a plausible mechanism through which leadership may influence satisfaction. McClelland's needs theory identifies achievement, affiliation and power as important drivers of motivated work behavior [16]. Previous studies show that transformational leadership, positive management, clear organisational goals, and collaborative work processes are associated with motivation and engagement [8], [17], while motivational conditions are associated with job satisfaction and work outcomes [18]–[20]. Job satisfaction itself reflects employees' responses to multiple facets of work, including pay, promotion, supervision, rewards, co-workers, and communication [21], and has been linked to transformational leadership, internal service quality, wellbeing, and retention-related outcomes [22]–[26]. Nevertheless, these approaches generally estimate separate direct relationships, treat motivation as an endpoint, or position satisfaction and motivation as

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mediators of employee performance. They therefore cannot determine how much of the leadership–satisfaction association in primary care is transmitted specifically through work motivation.

The issue is relevant at Gunung Kembang Public Health Centre. Preliminary management observations in 2025 suggested recurring absenteeism and employee concerns about compensation and career development. Because the reported absenteeism range was not derived from a denominator-defined administrative dataset, it is used only as contextual evidence and is not analysed as an outcome. These local concerns nevertheless indicate a workforce-management problem that warrants examination of leadership, motivation and job satisfaction. Taken together, the state of the art establishes that transformational leadership is associated with favourable workforce outcomes, but it does not adequately explain the mechanism linking leadership to job satisfaction in small Indonesian primary healthcare teams. The closest Indonesian studies primarily model employee performance as the final outcome and use motivation or satisfaction only as intermediate variables [27]–[31] Consequently, they cannot estimate job satisfaction as the focal outcome or quantify the proportion of the leadership association transmitted through work motivation. To address this gap, the present study proposes a PLS-SEM mediation model in which transformational leadership predicts work motivation and employee job satisfaction, while work motivation also predicts and mediates job satisfaction. PLS-SEM enables simultaneous assessment of the measurement and structural models and is suitable for the small, total-population sample available in this setting [32]. The novelty lies in testing and quantifying this mediation pathway within a single Indonesian primary healthcare centre rather than extrapolating from hospital-based evidence. Accordingly, this study aims to examine the associations of transformational leadership with work motivation and employee job satisfaction and to test whether work motivation mediates the leadership–satisfaction association among employees of Gunung Kembang Public Health Centre. Fig. 1 presents the proposed analytical framework, and four hypotheses were formulated. The study makes three contributions. Empirically, it provides evidence from a primary healthcare centre rather than a hospital. Analytically, it estimates both the direct and indirect pathways and quantifies the proportion of the leadership–satisfaction association carried through work motivation. Practically, it distinguishes leadership-related and motivation-related management targets while recognising that the cross-sectional design supports association rather than causal intervention claims.

H1: Transformational leadership is positively associated with work motivation.
H2: Transformational leadership is positively associated with employee job satisfaction.
H3: Work motivation is positively associated with employee job satisfaction.
H4: Work motivation mediates the association between transformational leadership and employee job satisfaction.

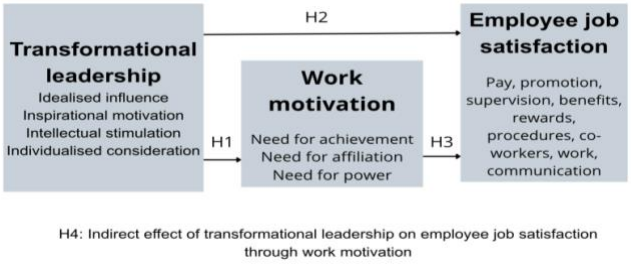


Fig. 1. Proposed research model showing the direct and mediated relationships among transformational leadership, work motivation, and employee job satisfaction.

II. Materials and Method

A. Research Design and Setting

This study used a quantitative, cross-sectional design. The setting was Gunung Kembang Public Health Centre, Seluma Regency, Bengkulu Province, Indonesia. The centre is a government primary healthcare facility that provides outpatient care, maternal and child health services, and community-based promotive and preventive programmes. Data were collected in March 2026. A cross-sectional design was selected because the study measures perceptions of leadership, motivation and satisfaction at a single point in time and does not track change over successive periods. This design enabled simultaneous measurement of the three study constructs among employees in the same organisational setting and provided the data needed to examine their associations within the proposed structural model.

B. Population and Sample

The study population consisted of all 42 employees of Gunung Kembang Public Health Centre, including nurses, midwives, general practitioners, laboratory staff, nutritionists, pharmacy staff and administrative personnel. Total sampling was applied, so the sample size equalled the population. This technique was chosen because the population was small and because excluding any staff group would have removed part of the organisational picture. Employees on study leave or long-term secondment during the collection period were not eligible. Partial least squares path modelling tolerates samples of this size when the model contains few structural paths, which supported the choice of analytical method [32], [33].

C. Research Instruments

Three instruments were used, each adapted into Indonesian for this setting rather than reproduced verbatim from the original licensed forms. Transformational leadership was measured with an Indonesian-adapted item set drawn from the Multifactor Leadership Questionnaire content described by Bass and Avolio, covering idealised influence, inspirational motivation, intellectual stimulation and individualised consideration [6]. The proprietary MLQ-5X instrument itself is licensed through Mind Garden; researchers wishing to reproduce the exact original wording should obtain it directly from that source rather than from this manuscript. Work motivation was measured with a three-subscale (five items each) adaptation of the Manifest

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Needs Questionnaire developed by Steers and Braunstein [34], covering the need for achievement, the need for affiliation, and the need for power, consistent with McClelland's needs theory [16]. Employee job satisfaction was measured with an eight-facet adaptation of the Job Satisfaction Survey developed by Spector [21], covering pay, promotion, supervision, facilities, co-workers, career development, contingent rewards and work-related communication; this adaptation combines and relabels some of Spector's original nine facets (dropping separate operating-procedures and nature-of-work facets and adding a career-development facet) to fit the primary healthcare context, and is therefore not a direct reproduction of the original nine-facet JSS. No items were reverse-scored. Both adapted scales received content-validity review as described below; a full independent psychometric validation study of the adapted Indonesian item sets, beyond that content-validity step, has not been conducted. All items were rated on a five-point Likert scale ranging from 1 for strongly disagree to 5 for strongly agree. The instruments were translated into Indonesian and back-translated into English to preserve item meaning. Two lecturers in hospital administration reviewed the translated items for content validity, and the wording was adjusted to match the primary healthcare context. Table 1 summarises the constructs, dimensions and item counts.

Table 1. Research constructs, dimensions, and measurement items.

Construct	Dimension	Items	Source
Transformational leadership (X)	Idealised influence; inspirational motivation; intellectual stimulation; individualised consideration	20	Multifactor Leadership Questionnaire
Work motivation (M)	Need for achievement; need for affiliation; need for power	15	McClelland needs theory
Employee job satisfaction (Y)	Pay; promotion; supervision; facilities; co-workers; career development; contingent rewards; communication	40	Job Satisfaction Survey

All items were rated on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree)

D. Data Collection

Data were collected through self-administered questionnaires distributed directly to all respondents after research permission had been obtained from the head of the health centre and the district health office. Before completing the questionnaire, respondents received an explanation of the study objectives, expected benefits, how confidential information would be handled, and their right to withdraw. Written informed consent was obtained from every respondent. Questionnaires were distributed and collected during working hours over four weeks, and respondents returned them in sealed envelopes without identifying marks. Two procedural steps were applied to limit common method bias. Anonymity was guaranteed in writing, and the predictor and criterion items were separated within the questionnaire [35]. All 42 questionnaires were returned, and none were excluded, giving a response rate of 100 per cent.

E. Data Processing and Analysis

No missing data occurred: all 42 questionnaires were returned complete, as verified against the raw response file (75 items per respondent, all values within the 1–5 range). No imputation was therefore required. Responses were converted into numerical values on the five-point scale and imported into SmartPLS version 4.1.1.7. Analysis followed the two-stage procedure recommended for partial least squares path modelling [32]. The PLS algorithm used a path-weighting scheme with a maximum of 300 iterations and a stop criterion of 10^{-7}. Bootstrapping for significance testing used 5,000 subsamples, the individual sign-change option and a two-tailed test at $\alpha = .05$ [32]. Section II-F presents the full statistical formulation, and Section II-G sets out the corresponding workflow and algorithm.

The measurement model was evaluated first. Indicator reliability was judged from outer loadings, with a threshold of 0.708. Indicators below that value were removed one at a time, and the model was re-estimated after each removal. Convergent validity was assessed from the average variance extracted, which was required to reach 0.50. Internal consistency reliability was assessed from Cronbach's alpha and composite reliability, both required to reach 0.70 [32], [36]. Discriminant validity was assessed using the heterotrait-monotrait ratio of correlations, with an upper limit of 0.90 for conceptually similar constructs [37], [38].

The structural model was evaluated second. Collinearity among predictor constructs was checked using the variance inflation factor; the inner VIF between transformational leadership and work motivation as joint predictors of employee job satisfaction was 2.79, below the conservative threshold of 3.3. Common method bias was additionally checked with a full-collinearity test [39]: each construct was regressed against a random marker variable together with the other constructs, yielding VIF values of 3.54 (leadership), 3.68 (motivation) and 4.04 (satisfaction). These values exceed the conservative 3.3 threshold, so common method variance cannot be ruled out; this is reported as a limitation rather than addressed through procedural controls alone. Explanatory power was assessed from the coefficient of determination and effect size from the f-squared statistic. A supplementary, independent out-of-sample cross-validation (leave-one-out, implemented separately in Python/scikit-learn, benchmarked against ordinary least squares regression) was also run and is reported alongside, but distinguished from, SmartPLS's own Blindfolding Q-squared procedure,

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which was not exported for this analysis. Hypotheses were tested using bootstrapping with 5,000 subsamples at a two-tailed significance level of 5 per cent [32]. A path was treated as significant when the t statistic exceeded 1.96 and p was below 0.05. A post hoc power analysis (k = 2 predictors, n = 42, α = .05) indicated 80 per cent power to detect $f^2 \geq 0.267$ (a medium-to-large effect); post hoc power at the observed effect sizes was 0.89 for the leadership-to-satisfaction path, 0.93 for the motivation-to-satisfaction path, and above 0.99 for the leadership-to-motivation path. The design was therefore adequately powered for the associations it found but was not powered to reliably detect small effects [33]. Mediation was assessed from the significance of the indirect effect and from the variance accounted for statistic, calculated as the indirect effect divided by the total effect. A value below 20 per cent indicates no mediation, a value between 20 and 80 per cent indicates partial mediation, and a value above 80 per cent indicates full mediation [40].

F. Model Specification and Statistical Formulation

Three reflectively measured constructs are analysed: transformational leadership (TL, exogenous predictor), work motivation (WM, mediator) and employee job satisfaction (EJS, outcome). In the measurement model, z_j denotes a latent construct and x_{ij} its observed indicator; the structural model relates the constructs. Eqs. (1)-(8) define the measurement model and its assessment criteria [32], [37],[36], [41].

$$x_{ij} = \lambda_{ij} z_j + \varepsilon_{ij} \quad (1)$$

$$\hat{z}_j = \sum_{i=1}^{n_j} w_{ij}\, x_{ij} \quad (2)$$

$$\lambda_{ij} \geq 0.708 \;\Leftrightarrow\; \lambda^2_{ij} \geq 0.50 \quad (3)$$

$$\mathrm{AVE}_j = \frac{\sum_i \lambda_{ij}^2}{\sum_i \lambda_{ij}^2 + \sum_i \mathrm{Var}(\varepsilon_{ij})} \quad (4)$$

$$\alpha = \left[\frac{k}{k-1}\right] \cdot \left[1 - \frac{\sum_i s_i^2}{s_t^2}\right] \quad (5)$$

$$\rho_c = \frac{(\sum_i \lambda_i)^2}{(\sum_i \lambda_i)^2 + \sum_i \mathrm{Var}(\epsilon_i)} \quad (6)$$

$$\rho_A = (w^T w)^2 \cdot \frac{w^{T(S - \mathrm{diag}\, S)w}}{w^{T(ww^T - \mathrm{diag}(ww^T))w}} \quad (7)$$

$$\mathrm{HTMT}_{jk} = \frac{\mathrm{mean}(r_{jk})}{\sqrt{\mathrm{mean}(r_{jj}) \cdot \mathrm{mean}(r_{kk})}} \quad (8)$$

Here, i indexes observed indicators and j indexes latent constructs; λ_{ij} is an indicator's standardised outer loading, w_{ij} its outer weight, ε_{ij} its measurement error, and $\hat{z}_j$ its estimated construct score. The symbols n and k denote the number of retained indicators and the item count, respectively. For reliability assessment, α is Cronbach's alpha, ρC is composite reliability, ρA is consistent reliability, and s_i^2 and s_t^2 are item and total-score variances, S is the indicator covariance matrix and w the weight vector. For HTMT, r_{jk} denotes between-construct indicator correlations, while r_{jj} and r_{kk} denote correlations within constructs. Eq. (3) is the indicator reliability rule, Eq. (4) the convergent validity criterion, Eqs. (5) to (7) the internal consistency measures, and Eq. (8) the discriminant validity criterion [32], [37], [36], [41]. Eqs. (9)-(16) define the structural model, its collinearity diagnostics, and its explanatory statistics [39], [33]. Eq. (9) is the general form; Eqs. (10) and (11) state the two structural relations estimated in this study.

$$\eta = B\eta + \Gamma\xi + \zeta \quad (9)$$

$$WM = \gamma_1 \cdot TL + \zeta_1 \quad (10)$$

$$EJS = \gamma_2 \cdot TL + \beta_1 \cdot WM + \zeta_2 \quad (11)$$

$$VIF_k = \frac{1}{1 - R_k^2} \quad (12)$$

$$FCVIF_j = \frac{1}{1 - R^2_{j=\mathrm{all}}} \quad (13)$$

$$R^2 = 1 - \frac{SS_{res}}{SS_{tot}} \quad (14)$$

$$R^2_{adj} = 1 - (1 - R^2) \cdot \frac{n-1}{n-k-1} \quad (15)$$

$$f^2 = \frac{R^2_{\mathrm{incl}} - R^2_{\mathrm{excl}}}{1 - R^2_{\mathrm{incl}}} \quad (16)$$

Here η is the vector of endogenous constructs, ξ is the exogenous construct, B and Γ are path-coefficient matrices, and ζ is the structural residual. TL, WM and EJS abbreviate transformational leadership, work motivation and employee job satisfaction. The coefficients γ_1, γ_2 and β_1 quantify the TL–WM, TL–EJS and WM–EJS paths, respectively. For collinearity, R^2_k is the coefficient of determination from regressing predictor k on the remaining predictors; R^2_j,all is obtained by regressing construct j on the other constructs and a marker variable. For explanatory statistics, SSres and SStot denote residual and total sums of squares; n = 42 is the sample size, k the number of predictors, and R^2incl and R^2excl the R^2 values with and without the focal predictor. Eq. (13) is the full collinearity test used here as the statistical check for common method variance [39]. Thresholds applied were VIF < 3.3, and f^2 values of 0.02, 0.15 and 0.35 for small, medium and large effects [32], [33]. Eqs. (17)-(23) define the inferential, mediation, and predictive statistics [40], [32], [42].

$$\mathrm{SE}^*(\hat{\theta}) = \sqrt{\frac{1}{B-1}\sum_{b=1}^{B}\left(\hat{\theta}_b^* - \overline{\theta}^*\right)^2} \quad (17)$$

$$t = \frac{\hat{\theta}}{\mathrm{SE}^*(\hat{\theta})} \quad (18)$$

$$\mathrm{CI}_{95\%} = \hat{\theta} \pm 1.96\, \mathrm{SE}^*(\hat{\theta}) \quad (19)$$

$$\text{Indirect effect} = \gamma_1 \cdot \beta_1 \quad (20)$$

$$\text{Total effect} = \gamma_2 + (\gamma_1 \cdot \beta_1) \quad (21)$$

$$\mathrm{VAF} = \frac{\gamma_1 \beta_1}{\gamma_2 + \gamma_1 \beta_1} \times 100\% \quad (22)$$

$$Q^2_{\mathrm{LOO}} = 1 - \frac{\sum_{i=1}^{n}(y_i - \hat{y}_{(-i)})^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2} \quad (23)$$

Here $\hat{\theta}$ is the estimate from the original sample; θ^{*b} is the corresponding estimate from bootstrap resample b; θ^* is the mean bootstrap estimate; B = 5,000 is the number of bootstrap subsamples; and $\mathrm{SE}^*(\hat{\theta})$ is the bootstrap standard error. The normal critical value $z_{0.975} = 1.96$ defines a two-sided 95% interval. For predictive evaluation, y_i is the observed outcome of respondent i, and $\hat{y}_{(-i)}$ is its predicted outcome from a model fitted without that respondent, and $\bar{y}$ is the overall outcome mean. Eq. (19) gives a normal-theory interval, which is reported here because the bootstrap distributions of the estimated paths were approximately symmetric. Eq. (22)

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classifies mediation as absent below 20 per cent, partial between 20 and 80 per cent, and full above 80 per cent, and is used in this study only as a descriptive supplement to the significance and sign of the direct and indirect paths [40]. Eq. (23) is a leave-one-out cross-validated statistic computed independently in Python, and is reported as an out-of-sample predictive check rather than as an in-sample measure of predictive relevance [42].

G. Analysis Workflow and Algorithm

Fig. 2 sets out the complete analytical workflow, from participant recruitment through questionnaire administration, preprocessing, measurement-model assessment, structural-model assessment, bootstrapping, mediation testing and out-of-sample validation. The iterative purification loop shown at the measurement-model stage removed 13 of the original 75 indicators. The measurement model was evaluated before interpretation of the structural relationships, followed by assessment of collinearity, coefficients of determination and the hypothesised path coefficients. Statistical significance of the direct and indirect relationships was subsequently evaluated using bootstrapping with 5,000 subsamples. The mediation analysis then examined whether work motivation transmitted part of the association between transformational leadership and employee job satisfaction.

The same procedure is stated below as a step-by-step algorithm so that the analysis can be reproduced from the raw response matrix. Algorithm 1 summarises the sequential analytical procedure, beginning with data preparation and measurement-model assessment and continuing through structural-model evaluation, bootstrapping and mediation analysis. The procedure reflects the same analytical stages presented in Fig. 2 and provides a structured representation of the steps used to evaluate the proposed relationships among transformational leadership, work motivation and employee job satisfaction. Presenting the workflow in algorithmic form also clarifies the order in which the measurement and structural assessments were conducted before evaluating the study hypotheses and the mediating role of work motivation.

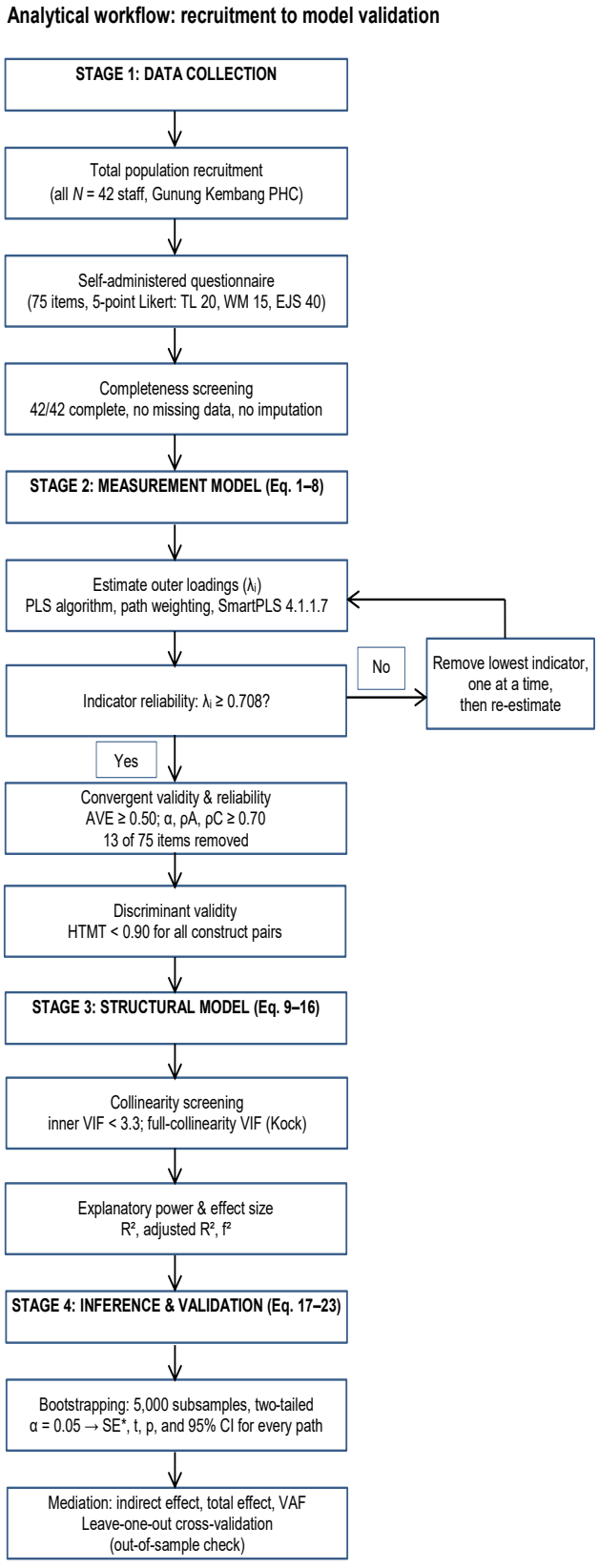


Fig. 2. Analytical workflow of the partial least squares path modelling procedure, from participant recruitment to out-of-sample validation, with the corresponding equation numbers for each stage.

III. Results

A. Respondent Characteristics

All 42 employees of Gunung Kembang Public Health Centre participated. Respondent characteristics were analysed by sex, age, highest educational attainment and length of service. Table 2 presents the distribution. Female healthcare professionals formed the majority of respondents, mainly nurses and midwives, which matches the typical workforce profile of Indonesian public health centres. Most respondents fell within the 25 to 44-year age band, most held a diploma or a bachelor's degree, and most had served at the centre for more than one year. These figures are reported descriptively; the sample (n = 42) is too small to support a statistical test of whether any demographic characteristic influenced questionnaire interpretation or leadership perception, and no such claim is made here.

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Algorithm 1. PLS-SEM estimation and validation procedure

(1) **Input**: response matrix X (42 × 75); construct assignment map M; thresholds λ_{min} = 0.708, AVE_{min} = 0.50, ρ_{min} = 0.70, $HTMT_{max}$ = 0.90, VIF_{max} = 3.3
(2) **Output**: path coefficients, effect sizes, mediation decomposition, predictive statistics
(3) Verify completeness of X; abort if any cell is missing or outside [1, 5]
(4) Initialise outer weights w and estimate construct scores by Eq. (2)
(5) **REPEAT**
(6) Estimate outer loadings λ by Eq. (1)
(7) **IF** min(λ) < λ_{min} **THEN** remove the lowest-loading indicator from X
(8) **UNTIL** min(λ) ≥ λ_{min} or removal would reduce AVE below AVE_{min}
(9) Compute AVE, α, ρ_A and ρ_C by Eqs. (4) to (7); record threshold departures
(10) Compute HTMT by Eq. (8); assert $HTMT_{jk}$ < $HTMT_{max}$ for every construct pair
(11) Estimate the structural relations of Eqs. (10) and (11)
(12) Compute inner VIF by Eq. (12) and full-collinearity VIF by Eq. (13)
(13) Compute R^2, adjusted R^2 and f^2 by Eqs. (14) to (16)
(14) **FOR** b = 1 to B = 5,000 do
(15) Draw a resample of size 42 with replacement; re-estimate; store θ^{*b}
(16) **END FOR**
(17) Compute SE*, t, p and 95% CI by Eqs. (17) to (19)
(18) Compute indirect, total effect and VAF by Eqs. (20) to (22)
(19) **FOR** i = 1 to 42 do
(20) Fit the model omitting case i; predict $\hat{y}_{(-i)}$
(21) **END FOR**
(22) Compute Q^2_{loo} by Eq. (23); return all statistics

Table 2. Demographic and professional characteristics of respondents (n = 42).

Characteristic	Category	n	%
Sex	Male	9	21.4
	Female	33	78.6
Age (years)	< 25	0	0
	25–34	22	52.4
	35–44	17	40.5
	≥ 45	3	7.1
Highest education	Diploma (D3)	27	64.3
	Bachelor (S1) or professional	15	35.7
	Master (S2)	0	0
Length of service (years)	≤ 1	3	7.1
	> 1–5	12	28.6
	> 5	27	64.3

Percentages are calculated against the total of 42 respondents.

Table 3. Indicator retention and removal after measurement-model purification.

Construct	Retained / original	Items removed
Transformational leadership	17 / 20	II3, IM2, IC5
Work motivation	13 / 15	NF4, NP4
Employee job satisfaction	32 / 40	GAJI1, GAJI2, GAJI3, GAJI5, FAS3, REKAN1, REKAN5, KARIER2

Removed items are named but their pre-deletion loadings are not reported: SmartPLS's outer-loadings export reflects only the final (post-deletion) model, and the pre-trimming values were not available for this revision. Job satisfaction was specified as a single reflective construct with eight conceptual facets, so purification was conducted against the overall construct rather than each facet separately, which explains the uneven removal across facets (e.g., 4 of 5 pay items).

Purification retained 62 of the original 75 indicators, an overall retention rate of 82.7 per cent. Retention was uneven across constructs: 17 of 20 leadership items were retained (85.0 per cent), 13 of 15 motivation items (86.7 per cent) and 32 of 40 job satisfaction items (80.0 per cent). Removal was also uneven across the satisfaction facets. Four of the five pay items were removed, leaving that facet represented by a single indicator, whereas the supervision, promotion, and communication facets lost none. Table 3 names every removed indicator. These results show that indicator removal was concentrated more heavily in the job satisfaction construct, particularly in the pay facet, rather than being distributed uniformly across the three constructs.

B. Measurement Model Evaluation

The measurement model was evaluated before any structural estimate was interpreted. Indicators with outer loadings below 0.708 were removed iteratively, and the model was re-estimated after each removal until every retained indicator met the threshold or, for a small number of borderline indicators retained for content-coverage reasons, until the average variance extracted for the parent construct remained above 0.50. Thirteen of the original 75 items were removed in total; Table 3 lists every removed item by name. The retained indicators were then assessed for convergent validity and internal consistency reliability. Table 4 reports the results. This evaluation established the adequacy of the retained measurement model before assessment of the structural relationships.

Every construct exceeded the 0.50 threshold for average variance extracted. Transformational leadership reached 0.594, work motivation reached 0.627 and employee job satisfaction reached 0.633. Cronbach's alpha ranged from 0.950 to 0.981, rho_A from 0.954 to 0.984, and composite reliability from 0.956 to 0.982, which places all three constructs well above the 0.70 requirement. Values above 0.95 also indicate item redundancy: a direct check of inter-item correlations within each construct found mean values of .57 for leadership, .59 for motivation and .61 for satisfaction, with

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16 of 496 item pairs in the satisfaction construct exceeding r = 0.85. This redundancy is returned to in the limitations. Discriminant validity was examined using the heterotrait-monotrait ratio of correlations. Table 5 reports the values for each construct pair.

Table 4. Convergent validity and construct reliability of the measurement model.

Construct	Items retained	AVE	Cronbach α (rho_A)	CR
Transformational leadership	17 / 20	0.594	0.957 (0.959)	0.961
Work motivation	13 / 15	0.627	0.950 (0.954)	0.956
Employee job satisfaction	32 / 40	0.633	0.981 (0.984)	0.982

AVE = average variance extracted; CR = composite reliability. Thresholds: AVE ≥ 0.50; Cronbach's α and CR ≥ 0.70.

Table 5. Discriminant validity assessment using the heterotrait–monotrait ratio (HTMT).

Construct	TL	WM	EJS
Transformational leadership (TL)	–		
Work motivation (WM)	0.838	–	
Employee job satisfaction (EJS)	0.837	0.846	–

Discriminant validity is established when every heterotrait-monotrait value falls below 0.90.

All heterotrait-monotrait values remained below the 0.90 liberal limit recommended for conceptually related constructs [37], though all three were clustered close to it (0.837–0.846), which is consistent with the conceptual closeness of leadership, motivation, and satisfaction in this literature. Transformational leadership, work motivation and employee job satisfaction were therefore treated as empirically distinguishable, and the measurement model was accepted for structural analysis, while this closeness is noted as a further signal of the shared-method-variance concern discussed below. Although the values satisfied the adopted discriminant-validity criterion, their proximity to the threshold warrants cautious interpretation because the three constructs were measured from the same respondents using self-reported questionnaire data.

C. Structural Model Evaluation

Collinearity was checked before the paths were interpreted. The inner variance inflation factor between the two predictors of employee job satisfaction was 2.79, below the conservative threshold of 3.3, so collinearity did not distort the path estimates. Explanatory and predictive capacity were then assessed. Table 6 reports the coefficient of determination for each endogenous construct. Transformational leadership explained 65.7 per cent of the variance in work motivation (adjusted R^2 = 0.648). Transformational leadership and work motivation together explained 75.8 per cent of the variance in employee job satisfaction (adjusted R^2 = 0.746). The small gap between the unadjusted and adjusted values, 0.009 and 0.012 respectively, indicates that the explained variance is not inflated by the number of predictors. Both values exceed the 0.50 benchmark for moderate explanatory power, and the satisfaction model approaches the 0.75 benchmark for substantial power [32]. Accordingly, 34.3 per cent of the variance in work motivation and 24.2 per cent of the variance in employee job satisfaction remained unexplained by the predictors included in the respective structural models. These residual proportions indicate that factors outside the specified model may also contribute to variation in the two endogenous constructs. The leave-one-out cross-validated statistic reached 0.689, confirming that the model retains predictive accuracy on cases withheld from estimation. Fig. 3 displays the estimated structural model with its path coefficients and coefficients of determination.

Q_loo^2 is an out-of-sample statistic from leave-one-out cross-validation computed independently in Python (scikit-learn) by Eq. (23), benchmarked against ordinary least squares regression. It is not the SmartPLS blindfolding statistic and is not interpreted as in-sample predictive relevance. A single pooled figure is reported because the cross-validation was run on the full two-predictor model.

Table 6. Explanatory power and out-of-sample predictive performance of the structural model.

Endogenous construct	R^2	R^2 adjusted	Out-of-sample Q^2_{loo}
Work motivation (M)	0.657	0.648	0.689
Employee job satisfaction (Y)	0.758	0.746	0.689

D. Hypothesis Testing

Hypotheses were tested using bootstrapping with 5,000 subsamples at a two-tailed significance level of 5 per cent. Table 7 reports the path coefficients, t-statistics, p-values, and effect sizes for the direct paths. All three direct paths were positive and statistically significant. The strongest was the association between transformational leadership and work motivation (β = 0.811, t = 12.987, p < .001), whose effect size of f^2 = 1.915 is far above the 0.35 benchmark for a large effect and whose 95 per cent interval [0.689, 0.933] excludes zero by a wide margin, supporting H1. Transformational leadership was also directly associated with job satisfaction (β = 0.440, t = 2.950, p = .003, f^2 = 0.275, 95% CI [0.148, 0.732]), supporting H2, and work motivation with job satisfaction (β = 0.475, t = 3.215, p = .001, f^2 = 0.321, 95% CI [0.185, 0.765]), supporting H3. Both of the latter effect sizes fall between the 0.15 and 0.35 benchmarks, indicating medium to large effects. The two intervals for the satisfaction paths are wide, spanning 0.58 units each, which reflects the small sample and means the point estimates should be read as imprecise. One comparison deserves attention. The association between work motivation and job satisfaction exceeded the direct association between transformational leadership and job satisfaction, 0.475 against 0.440. Leadership therefore

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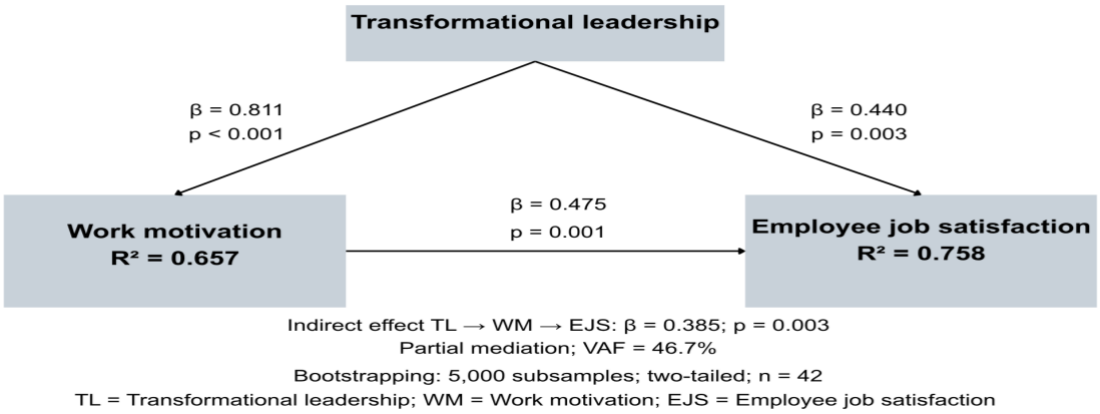


Fig. 3. Estimated structural model showing standardised path coefficients, statistical significance, and R^2 values for work motivation and employee job satisfaction.

Table 7. Direct structural path estimates and hypothesis-testing results.

Path	β	t	p	f^2	Decision
H1 TL → WM	0.811	12.987	< 0.001	1.915	Supported
H2 TL → EJS	0.440	2.950	0.003	0.275	Supported
H3 WM → EJS	0.475	3.215	0.001	0.321	Supported

TL = transformational leadership; WM = work motivation; EJS = employee job satisfaction. Bootstrapping with 5,000 subsamples, two-tailed, α = 0.05.

reaches satisfaction more strongly through motivation than directly, which sets up the mediation test.

E. Mediation Analysis

Mediation was assessed from the significance of the indirect effect and from the variance accounted for statistic. Table 8 reports the results. Work motivation significantly mediated the association between transformational leadership and employee job satisfaction. The indirect effect reached 0.385 with a t statistic of 2.985 and a p value of 0.003. The total effect of transformational leadership on employee job satisfaction was 0.825, of which 0.385 travelled through work motivation. The variance accounted for, at approximately 47 per cent, falls within the 20 to 80 per cent band conventionally used to describe partial (complementary) mediation. This classification rests primarily on the fact that both the direct effect (0.440) and the indirect effect (0.385) are positive and statistically significant; VAF is reported as a supporting descriptive quantity rather than the sole criterion. H4 was supported. The direct path from transformational leadership to employee job satisfaction remained significant after the mediator was introduced, which is the basis for describing the mediation as partial/complementary rather than full. Transformational leadership is therefore associated with employee job satisfaction through two routes at once. Slightly under half of the total association is carried through work motivation, and the remainder is direct.

SE* is the bootstrap standard error from 5,000 subsamples; the 95 per cent intervals are normal-theory intervals computed by Eq. (19). VAF is the indirect effect (0.385) divided by the total effect (0.825), by Eq. (22), giving 46.7 per cent. The bootstrap standard error of the total effect was not available in the exported output, so no interval is given for that row.

IV. Discussion

A. Transformational Leadership and Work Motivation

The cross-sectional design means every association reported in this section should be read as such, not as evidence of causal direction; reciprocal or reverse relationships (for example, motivated staff perceiving their leader more favourably) cannot be excluded. Transformational leadership showed the strongest single association in the model, with a path coefficient of 0.811. The more consistently the head of Gunung Kembang Public Health Centre is perceived to apply transformational behaviour, the higher the work motivation reported by staff. A coefficient of this magnitude also means that leadership accounts for most of the systematic covariation in motivation at this site. The result follows the logic of Bass and Avolio [6]. Idealised influence builds trust in the leader. Inspirational motivation connects daily tasks to a service goal that staff recognise. Intellectual stimulation invites employees to question routine procedures. Individualised consideration addresses development needs one person at

Table 8. Direct, indirect, and total effects with bootstrap estimates and 95% confidence intervals.

Effect	β	SE*	t	p	95% CI
TL → WM (direct)	0.811	0.062	12.987	< 0.001	0.689, 0.933
TL → EJS (direct)	0.440	0.149	2.950	0.003	0.148, 0.732
WM → EJS (direct)	0.475	0.148	3.215	0.001	0.185, 0.765
TL → WM → EJS (indirect)	0.385	0.129	2.985	0.003	0.132, 0.638
TL → EJS (total)	0.825	–	–	–	–

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Table 9. Quantitative comparison of the present findings with previous empirical studies.

Study (setting, n)	Association reported	Model R^2 / note	Interpretation
This study (Indonesia, puskesmas, n = 42)	TL→WM β = .811; TL→EJS β = .440 (direct); WM→EJS β = .475	R^2 (WM)=.657; R^2 (EJS)=.758; indirect effect=.385; total effect=.825; VAF=46.7%	Work motivation partially mediated the relationship between TL and EJS
-Qutaish et al. 2025 dan, govt. hospitals, n =)	TL→motivation r = .49, β = .342, p<.001	R^2(motivation) = .311	Same positive direction, but weaker than the present association.
Uslu Sahan & Terzioglu 2022 (Türkiye, univ. hospital, n = 153)	TL→job satisfaction (regression)	R^2(satisfaction) = .24	Lower than the present R^2, which reflected the combined contribution of TL and WM
Asif et al. (2019) (Pakistan, public hospitals, n=386)	TL→job satisfaction: β=.43; p<.01	Direct relationship	The coefficient was close to the present direct effect of β=.440
Choi et al. (2016) (Malaysia, two hospitals, n=200)	Direct effect=.231; indirect effect=.175; total effect=.406	VAF=43.1%; empowerment as mediator	Similar partial-mediation pattern, but with a different mediator
Boamah et al. (2018) (Canada, acute-care nurses, n=378)	TL→structural empowerment: β=.77; empowerment→job satisfaction: β=.86; both p<.001	Structural empowerment as mediator	Supports an indirect leadership mechanism through a construct different from WM

Notes: TL=transformational leadership; WM=work motivation; EJS=employee job satisfaction; β=standardised coefficient; R^2=coefficient of determination; VAF=variance accounted for. Statistics are reported according to the original studies. Differences in countries, occupational groups, sample sizes, instruments, constructs, and analytical methods should be considered when comparing their magnitudes.

a time. Read through McClelland's framework, these behaviours activate the need for achievement through target setting, the need for affiliation through team recognition, and the need for power through delegated responsibility [16]. The magnitude of the association exceeds what several hospital studies report, though direct comparison is limited by differences in country, sample size, instrument and structural specification (Table 9 summarises this comparison across studies). Abu-Qutaish et al. found a weaker association between transformational leadership and work motivation among Jordanian government hospital nurses (n = 125), reporting a correlation of r = .49 and a regression coefficient of β = .342, explaining 31.1 per cent of motivation variance [8]. Two features of the present setting may help explain the larger association found here. A public health centre with 42 staff has one visible leader, whereas hospital nurses answer to unit managers, nursing directors and medical supervisors whose behaviours dilute any single leadership signal. Physical proximity may also matter, since staff at a primary care centre observe their leader daily rather than through intermediaries. Kjellström et al. similarly found in well-functioning Swedish primary healthcare centres that positive management, clear organisational goals, collaborative work processes, and quality-improvement activities were important for professional work motivation, while financial incentives needed to be translated into quality patient care [17]. These are plausible explanations for a pattern observed in one small sample, not confirmed mechanisms. The present direct association between transformational leadership and job satisfaction (β=.440) was close to that reported by Asif et al. (β=.43) [43]. The VAF of 46.7% was also comparable to the 43.1% reported by Choi et al., although Choi et al. [44] examined empowerment rather than work motivation as the mediator. Similarly, Boamah et al. identified structural empowerment as an indirect mechanism linking transformational leadership with job satisfaction [45]. These findings support a general mediation pattern, but differences in mediators, settings, samples, and analytical methods limit direct numerical equivalence.

B. Transformational Leadership and Employee Job Satisfaction

Transformational leadership was positively and significantly associated with employee job satisfaction, with a path coefficient of 0.440. The association is moderate rather than large. Leadership style is therefore linked to how employees evaluate their work, though this cross-sectional association does not establish that leadership alone determines that evaluation. This pattern is broadly consistent with recent nursing evidence, though again with caution about direct comparability. Uslu Sahan and Terzioglu found that transformational practices among nurse managers were associated with job satisfaction and organisational commitment among staff nurses in a Türkiye university hospital (n = 153), with leadership explaining 24 per cent of job satisfaction variance [10]. Jameel et al. reported a comparable direct association among Pakistani nurses [23], and Gregoriou et al. found a similar pattern among physicians in the Cypriot public system [24]. Two recent systematic reviews of the nursing literature report correlations between transformational leadership and job satisfaction ranging from r = .43 to .94 across included

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studies, most commonly clustering around r = .45 to .76. The direct association found here (β = .440) sits within that published range [12].

Studies that model intervening variables help explain why the direct effect is only moderate. Alruwaili found that organisational justice and quality of work life carried much of the influence of transformational leadership on nurse wellbeing [13]. Ofei et al. showed that job satisfaction itself acts as a transmission point between manager behaviour and turnover intention [22]. Curado and Santos reported a similar structure linking leadership, satisfaction and performance [9]. Leadership rarely reaches satisfaction in a single step, and the present model reproduces that finding. The preliminary survey at Gunung Kembang Public Health Centre supports the same reading. Staff reported dissatisfaction with compensation and career development, and neither of these lies fully within the authority of the head of the centre. Facets governed by district and national policy set a ceiling on what leadership alone can achieve, consistent with the nine-facet structure described by Spector [21] and the findings of Goula et al. on internal service quality [25].

C. Work Motivation and Employee Job Satisfaction

Work motivation was positively and significantly associated with employee job satisfaction, with a path coefficient of 0.475. This exceeds the direct association of transformational leadership. Motivation is therefore the stronger proximal correlate of how staff evaluate their work at this site, within the limits of a cross-sectional, single-centre design. McClelland's framework accounts for the result [16]. Employees who meet achievement targets, who maintain constructive relationships with colleagues, and who exercise responsibility within their scope of practice derive satisfaction from the work itself rather than from its external rewards. Liu et al. found the same ordering among primary health service practitioners, where motivational factors predicted satisfaction more strongly than demographic or contractual characteristics [18]. The practical reading is offered cautiously, since the absenteeism figure reported in the Introduction is a management impression rather than a documented statistic (see Introduction and Limitations). If accurate, it would be consistent with motivated staff being more likely to attend and to absorb additional caseload. Labrague et al. documented weak leadership practice being associated with higher absenteeism and turnover intention through reduced satisfaction in a hospital sample [15]; whether the same pattern holds at Gunung Kembang cannot be confirmed from the present data.

D. The Mediating Role of Work Motivation

Work motivation partially mediated the association between transformational leadership and employee job satisfaction. The indirect effect reached 0.385, and the variance accounted for value was approximately 47 per cent. This is the finding with the clearest managerial consequence. A leadership development programme that raises transformational behaviour without touching the conditions that sustain motivation will capture only the direct half of the available effect. Recognition of performance, access to competency development, transparent task allocation and participation in decision-making are the conditions that keep the indirect path open. The mediating structure aligns with comparable models. Zhang et al. found that organisational climate mediated the effect of transformational leadership on work engagement among intensive care nurses [19]. Labrague reported work satisfaction as the mediator between transformational leadership and nurse-assessed quality of care [14]. AbdELhay et al. identified career growth and work wellbeing as the routes linking transformational leadership to retention [26]. Within Indonesian samples, Prabowo et al. and Hariadi and Muafi reported partial mediation of similar magnitude [27], [28]. The present study extends that evidence to a primary healthcare centre and reports the size of the indirect path rather than its significance alone. Partial mediation also carries a theoretical message. If motivation had carried the entire effect, leadership would matter only as a motivational input. It does not. The surviving direct path indicates that transformational behaviour shapes satisfaction through channels the model does not measure, including perceived fairness, supervisory support and the quality of communication [13], [25].

E. Theoretical and Practical Implications

The study contributes to leadership theory in three ways. It confirms that the Bass and Avolio framework operates in a small primary care team and not only in hospitals [6]. It positions McClelland's needs theory as a working explanatory mechanism rather than as a descriptive typology [16]. It also quantifies the split between direct and mediated influence, which most studies in this literature leave unreported. In practice, the findings point toward candidate actions rather than evidence-tested directives, since no intervention was actually trialled in this study. Individualised consideration was the transformational behaviour most closely associated with the need-for-achievement dimension of motivation in this sample, so regular individual consultations are a plausible candidate for prospective evaluation. Broadening competency development across staff groups, and increasing staff participation in scheduling and programme decisions, are similarly offered as candidates rather than as evidence-based directives; the earlier suggestion to tie recognition specifically to attendance, programme coverage and waiting-time indicators has been removed, since this study did not test that specific linkage and such incentives can carry unintended behavioural effects. Any of these actions should be piloted and evaluated prospectively before wider adoption. District health offices retain authority over compensation and career-progression policy, which lies outside what a facility head can address alone [1], [2].

F. Limitations and Future Research

Several limitations qualify the findings. The cross-sectional design captures associations at one point in time and cannot establish causal order, so the possibility that satisfied employees rate their leader more favourably cannot be excluded; all results are reported as associations rather than effects for this reason. The study covered a single health centre with 42 respondents, which limits statistical power (post hoc power was 0.89–0.93 for the two smaller paths; the design was powered to detect medium-to-large effects only, $f^2 \geq 0.267$ at 80 per cent power) and restricts generalisation to other facilities, even though the sample represents the full population of this centre. A full-collinearity check produced variance inflation factors of 3.54

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to 4.04 across the three constructs, above the conservative 3.3 threshold, so common method variance cannot be ruled out despite the procedural safeguards applied [39]. Reliability coefficients above 0.95, together with a mean inter-item correlation of .61 and 16 item pairs above r = .85 within the satisfaction scale, indicate item redundancy that future work should address by empirically shortening the instruments, a step not undertaken here [32]. Measurement-model purification removed 13 of the original 75 items [32], unevenly across facets (Table 3), because job satisfaction was specified as a single reflective construct rather than a formative or higher-order structure; a different specification might have retained facet coverage more evenly. The pay facet, in particular, was reduced to a single retained item, which further limits the interpretability of that facet. Finally, the adapted instruments used here have not been independently validated as Indonesian psychometric scales beyond the content-validity step reported in Methods.

One further implication of these measurement properties deserves statement. High reliability, heterotrait-monotrait ratios clustered narrowly between 0.837 and 0.846, and a coefficient of determination of 0.758 obtained in a 42-case sample together raise the possibility that the model is fitted to the idiosyncrasies of this particular sample rather than to a stable population structure. The leave-one-out cross-validated statistic of 0.689 argues against severe overfitting, because it was computed on cases withheld from estimation rather than on the estimation sample itself. It does not exclude the milder form of the problem. Redundant items, a purified indicator set and a small sample interact in the same direction: each tends to raise apparent model fit without raising the quality of the underlying measurement. The coefficients reported here should therefore be read as an upper-bound description of one health centre rather than as stable population estimates, and replication in a larger multi-centre sample is the appropriate test of whether they hold. The model also excluded variables with established relevance, including organisational culture, workload, compensation and organisational commitment. Future studies should recruit staff from several public health centres or districts, apply a longitudinal or multi-wave design to establish temporal order, and collect leadership ratings from a source other than the employees who report their own satisfaction. Adding organisational justice and workload to the model would test whether the surviving direct path narrows further [13]. Testing the same model in Muhammadiyah and other faith-based primary care networks would show whether organisational values alter the size of the mediated effect.

V. Conclusion

This study modelled the associations of transformational leadership with work motivation and employee job satisfaction, and tested the mediating role of work motivation, among all 42 employees of a single primary healthcare centre using partial least squares path modelling. All four hypotheses were supported. Transformational leadership was associated with work motivation (β = 0.811) and with employee job satisfaction (β = 0.440), and work motivation with employee job satisfaction (β = 0.475). Work motivation partially and complementarily mediated the leadership-satisfaction association, with an indirect effect of 0.385, a total effect of 0.825, and a variance accounted for of 46.7 per cent. The model explained 65.7 per cent of the variance in motivation and 75.8 per cent in satisfaction. These are cross-sectional associations from one small site, obtained with instruments showing item redundancy and under a full-collinearity result that does not exclude common method variance, and they should not be read as causal effects. The practical implication is specific: because almost half of the leadership association travels through motivation, leadership development in primary care should be paired with measures that sustain staff motivation rather than delivered alone. Future work should test this model across multiple health centres with adequate power, using a longitudinal design that separates the sources of leadership and satisfaction ratings and validates shortened instruments.

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Author Contributions

Evantri: conceptualisation, study design, data collection, data analysis, interpretation of findings and manuscript preparation. Qurratul Aini: study design, methodological supervision, validation of the analytical results, scientific guidance, critical review and manuscript revision. Both authors have read and approved the final version of the manuscript and accept responsibility for the content of the published article.

Data Availability

The de-identified participant-level dataset may be made available by the corresponding author upon reasonable written request for legitimate scholarly purposes, subject to approval by the designated data custodian and the relevant research ethics committee. For this study, access is subject to authorisation from the Head of Gunung Kembang Public Health Centre, as the institutional data custodian, and, where required, the Health Research Ethics Committee, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta. Access may require an approved research protocol and a data-use agreement. Data that could permit direct or indirect participant re-identification will not be shared.

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Code Availability

Primary analyses (measurement and structural model estimation, bootstrapping, HTMT, collinearity) were performed in SmartPLS version 4.1.1.7. Supplementary analyses reported alongside the SmartPLS output the full-collinearity common method bias check, the post hoc power analysis, and the independent out-of-sample cross-validation were performed in Python (pandas, statsmodels, scikit-learn, scipy) directly on the anonymised raw response data. This custom code is available from the corresponding author on reasonable request.

Ethical Approval

This study was approved by the Health Research Ethics Committee, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta (No. 055/EC-KEPK FKIK UMY/III/2026) on 6 March 2026, before participant recruitment and data collection began. The study followed established research ethics principles, including the seven World Health Organization standards of 2011 and the 2016 International Ethical Guidelines of the Council for International Organizations of Medical Sciences. Confidentiality of participant data, participant rights and the informed consent process were maintained throughout.

Consent To Participate

Before data collection, all participants received a full explanation of the study objectives, benefits, procedures and their rights as research participants. Written informed consent was obtained from all participants before enrolment. Participants were informed that participation was voluntary and that they could decline or withdraw at any time without consequence. All information collected was treated as confidential and used solely for research purposes.

Consent for Publication

All participants consented to the use of their anonymised data in scientific publications. The data presented in this manuscript are reported in aggregated and anonymised form. No personal information or identifying details that could directly or indirectly reveal the identity of any participant are included.

Competing Interests

The authors declare that they have no competing financial or non-financial interests that could have influenced the conduct of the study, the data analysis, the interpretation of the findings, or the preparation and publication of this manuscript.

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