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Lecturers' job satisfaction questionnaire (LJSQ): Development, construct validity, and bifactor modelling in Nigerian universities

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Abstract There is currently a dearth of a culturally sensitive instrument for measuring job satisfaction among university lecturers in Africa, specifically Nigeria. To bridge this gap, we developed and psychometrically tested the Lecturers' Job Satisfaction Questionnaire (LJSQ) in two Nigerian universities. Content validity evidence was gathered through experts' ratings, with a quantitative approach followed in computing content validity indices at the item and scale level. The researchers refined and tested the Lecturers' Job Satisfaction Questionnaire (LJSQ) through a systematic process. A focus group discussion with 10 university lecturers guided its initial development, followed by pilot testing with 3,122 lecturers divided into three subsamples: 262 for Exploratory Factor Analysis (EFA), 1,300 for Confirmatory Factor Analysis (CFA), and 1,560 for bifactor modelling. Participants were allocated systematically across the subsamples to ensure a balanced distribution. Results of data analysis revealed a five-factor structure encompassing satisfaction with work conditions, workload allocation, remuneration, career advancement opportunity, and research support. The bifactor model demonstrated the best fit, among four competing models supported by reliability measures such as Cronbach's alpha, Omega coefficients, and split-half reliability, alongside convergent and discriminant validity, confirming its effectiveness in assessing job satisfaction. Conclusively, the applicability of the LJSQ transcends disciplinary and institutional boundaries, providing a foundation for future cross-cultural validation and longitudinal studies.

Keywords: academic staff, factor analysis, instrument validation, scale development, structural equation modelling

1. Introduction

Job satisfaction, a topic extensively explored in scholarly literature for over a century (Castaneda & Scanlan, 2014), has become one of the most thoroughly investigated variables in organisational psychology (Lu et al., 2012). Job satisfaction is crucial in the workplace, particularly for higher education lecturers. It significantly influences their productivity, motivation, and well-being (Albert et al., 2018). For higher education lecturers, job satisfaction is essential for their professional fulfilment and the quality of education they provide to students (Agbozo et al., 2017). Job satisfaction can also impact employee retention, with satisfied lecturers being more likely to remain in their positions and contribute to the long-term success of their institutions (Irabor & Okolie, 2019). Furthermore, job satisfaction can influence the quality of teaching and research, as satisfied lecturers are more likely to be engaged and effective in their roles (Han et al., 2020).

Despite the significance of job satisfaction among lecturers, a contextual research gap exists, notably in the absence of a tailored instrument for assessing job satisfaction in Africa. Moreover, existing instruments (Refer to supplementary data 2) have mostly been developed to measure job satisfaction among the medical population, with a limited focus on higher education lecturers. This creates a population gap because instruments designed to measure job satisfaction among other populations inadequately address the unique dynamics and challenges lecturers face. The lack of a culturally sensitive instrument impedes accurate measurement of job satisfaction among African lecturers, as cultural and contextual factors significantly impact perceptions (Özcan, 2021).

Instruments not designed for the African academic context may lack precision in measuring job satisfaction among academic staff, necessitating consideration of the unique characteristics of this environment in instrument development (Kim et al., 2023). Given their distinct responsibilities and expectations, the scarcity of tools tailored for university lecturers further hinders comprehensive research on job satisfaction (Pepe et al., 2017). These gaps compromise the reliability and validity of research findings on job satisfaction among African lecturers, potentially leading to misleading conclusions. The lack of targeted research tools impedes evidence-based policy development to enhance lecturer job satisfaction. However, ecognising specific factors influencing satisfaction is essential for effective strategies to improve the work environment (Hoque et al., 2023). Developing culturally sensitive instruments for assessing job satisfaction among African lecturers would yield more accurate findings, facilitating tailored interventions and policies for the academic community. Closing these gaps aligns with promoting diversity in research methodologies, acknowledging the need for region-specific instruments that considers the socio-cultural aspects of the African academic landscape (Schulze, 2006; Toit & Klerk, 2023). These justifications formed the basis for the current study to develop and test the Lecturers’ Job Satisfaction Questionnaire (LJSQ).

1.1. Concept of job satisfaction

There is no universally accepted definition for job satisfaction, leading to diverse interpretations among scholars. Early definitions, such as the one put forth by Hoppock (1935), emphasised the connection between job satisfaction and workers' emotional states, encompassing psychological well-being, physical comfort, and the overall work environment. Vroom (1964) further associated job satisfaction with how individuals perceive their specific roles and responsibilities, while Locke (1969) emphasised alignment with professional values, defining it as a favourable emotional reaction to work.

Contemporary discussions have refined the concept, with Thangaswamy and Thiyagaraj (2017) describing job satisfaction as an individual's overall feelings, attitudes, and emotions toward their work. Singh and Onahring (2019) defines job satisfaction as the perceived alignment between expected and actual performance and rewards. Dhir et al. (2020) argued that job satisfaction involves objective and subjective elements contributing to individual variation. Mérida-López et al. (2019) characterised job satisfaction as an evaluative state covering satisfaction with the job and positive associated emotions. Fan et al. (2019) extend the perspective, by linking job satisfaction to mental health and employee turnover. Factors influencing job satisfaction include the nature of the job, achievement, responsibility, work environment, relationships, compensation, and growth opportunities (Alzubi et al., 2023). Social capital, leadership, orientation, and self-perceived efficacy are other important factors (Aloisio et al., 2019).

In examining job satisfaction, researchers acknowledge its multidimensional nature, incorporating cognitive, affective, and behavioural components (Koustelios & Tsigilis, 2005). Cognitive assessments focus on individuals' thoughts and evaluations of workplace activities; affective components involve feelings about the job; and behavioural aspects reflect attitudes and behaviours toward work (Thompson & Phua, 2012). Facet-level evaluations, considering appreciation, communication, and job conditions, highlight the need for a comprehensive understanding of job satisfaction (Dicke et al., 2020).

1.2. Conceptual framework

The development of the instrument adhered to the conceptual model illustrated in Figure 1, emphasising a systematic approach to ensure its relevance and effectiveness. The conceptual model depicted in Figure 1 suggests that job satisfaction is a multidimensional construct comprising three core dimensions influenced by the foundational inputs of Richard and Porter (1975). These scholars conceived job satisfaction as a complex entity formed by an individuals' emotional or affective responses, cognitive evaluations, and behavioural outcomes associated with their work. Furthermore, job satisfaction is conceptualised to have two primary sources: extrinsic and intrinsic (Wernimont, 1966).

The Venn diagram in Figure 1 intersects the three dimensions with the two sources of job satisfaction, leading to the creation of second-order dimensions, including affective-extrinsic, affective-intrinsic, cognitive-extrinsic, cognitive-intrinsic, behavioural-extrinsic, and behavioural-intrinsic factors. Affective-extrinsic factors are external influences affecting emotional experiences related to the job, including interpersonal relationships, organisational culture, work-life balance, recognition, and the work environment. Meanwhile, affective-intrinsic factors involve internal aspects intrinsic to the individual, influencing emotional experiences related to the job, such as personal values alignment, a sense of purpose, personal growth opportunities, internal motivation, and work enjoyment (Zhang, 2022).

On the other hand, cognitive-extrinsic factors represent external influences that influence cognitive processes, thinking patterns, or mental operations, such as organisational policies, leadership style, work environment, compensation, and career advancement opportunities. In contrast, cognitive-intrinsic factors reflect internal cognitive processes and evaluations when assessing job satisfaction, including job fit, meaningfulness, autonomy, learning opportunities, and self-efficacy (Dheer & Castrogiovanni, 2023).

Behavioural-extrinsic factors exert external influences on workplace behaviours, including organisational policies, leadership style, reward systems, team dynamics, and physical conditions. Meanwhile, behavioural-intrinsic factors refer to internal factors intrinsic to the individual that influence behaviours, such as internal drive, engagement, autonomy, personal values, and job crafting (Cho & Castañeda, 2019).

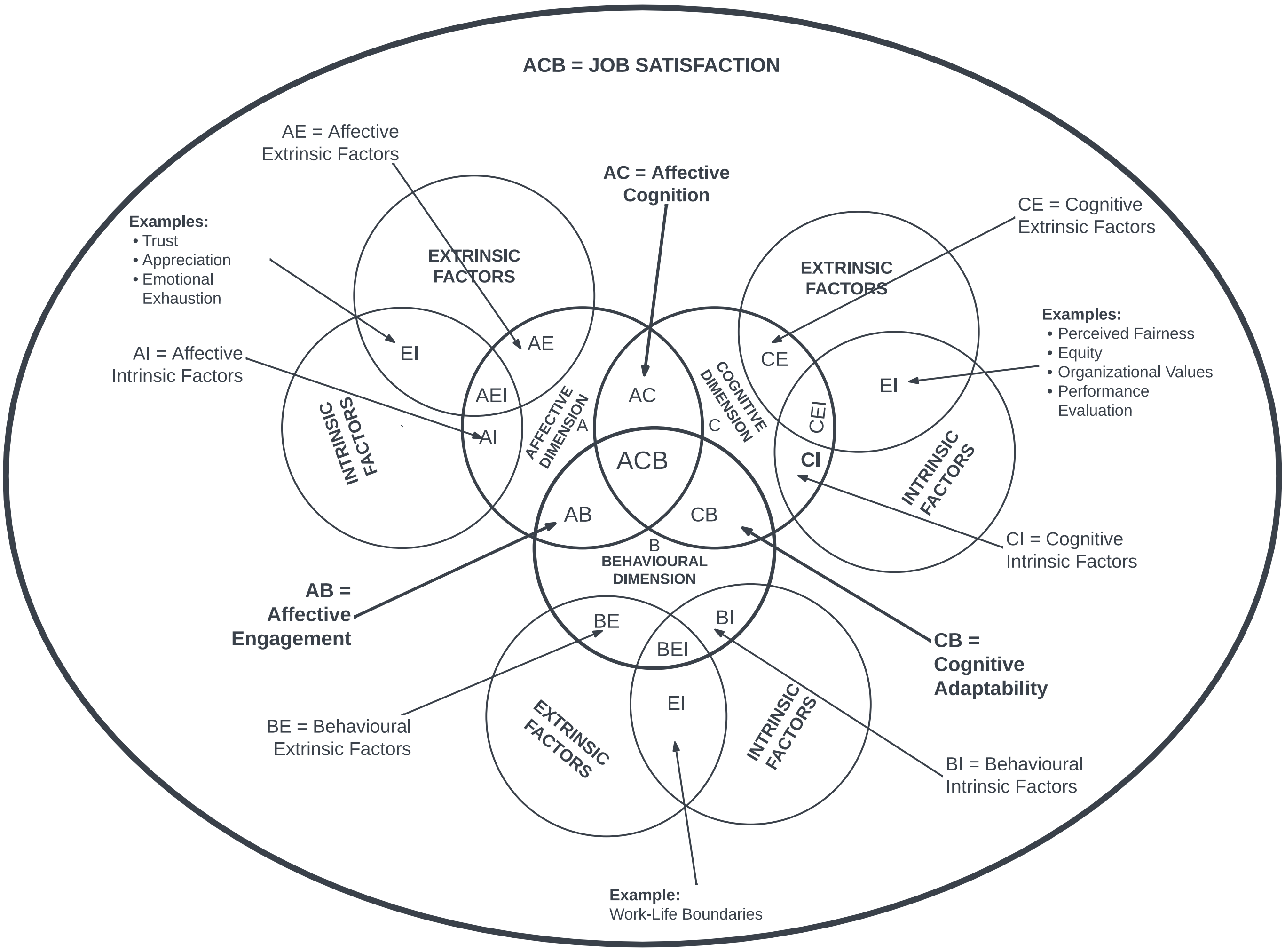

Figure 1 Conceptual model of job satisfaction developed for this study.

Figure 1 reveals intersections giving rise to distinct forms of job satisfaction: the affective-cognitive (AC) connection, cognitive-behavioural (CB) connection, and affective-behavioural (AB) connection, labelled affective cognition, cognitive adaptability, and affective engagement, respectively. Affective cognition emphasises the interplay between emotions and cognitive processes. Cognitive adaptability involves individuals' capacity to adjust cognitive processes, thinking patterns, and problem-solving strategies. Affective engagement is an individual's emotional investment in their work, reflected in behaviours and the level of involvement (Yang et al., 2022).

Despite numerous relationships established in the conceptual model, the ACB connection is considered in this study as the most pivotal, representing overall job satisfaction. This connection advocates for a balanced approach, in simultaneously addressing affective, cognitive, and behavioural dimensions of job satisfaction. Consequently, the present study considered five aspects of job satisfaction: work conditions, remuneration, workload allocation, career advancement opportunities, and research supportm, contributing to a comprehensive understanding of organisational contexts.

1.3. Review of previous instruments measuring job satisfaction

A comprehensive review of existing instruments designed to measure job satisfaction, as presented in supplementary data 2, reveals numerous past efforts. However, despite these endeavours, no prior instrument with satisfactory psychometric properties has been crafted to assess job satisfaction in Africa. Notably, there is an absence of instruments developed within Nigeria for this purpose. Moreover, the existing instruments primarily target diverse medical populations, with only a limited number designed with lecturers in mind. Recognising that "the validity of existing scales must be established in different employee groups because issues related to job satisfaction may vary from group to group" (Macdonald & MacIntyre, 1997, p.5), the creation of the Lecturers' Job Satisfaction Questionnaire (LJSQ) became imperative.

2. Materials and Methods

2.1. Instrument development

The “Lecturers’ Job Satisfaction Questionnaire (LJSQ)” was designed by the researchers to address the absence of a suitable instrument with acceptable psychometric properties in Nigeria, particularly in Cross River State, measuring job satisfaction among university lecturers. The questionnaire items were adapted and modified from existing instruments (Al-Rubaish et al., 2011; Churchill et al., 1974; Johnson, 1955; Nanjundeswaraswamy, 2019; Spector, 1985; Warr et al., 1979). The LJSQ was structured to align with the conceptual model of job satisfaction, covering areas such as satisfaction with work conditions, remuneration, workload allocation, career advancement opportunities, and research support. Initially, 40 items were developed for the questionnaire, organised on a five-point Likert-type scale. The response options were “Very Satisfied,” “Satisfied,” “Neutral,” “Dissatisfied,” and “Very Dissatisfied.”

2.2. Face and content validity

A printed version of the LJSQ was shared with nine independent experts to evaluate its face and content validity. The panel consisted of specialists in Research, Measurement and Evaluation (n = 5) and Educational Psychology (n = 4). Feedback was obtained from seven of these experts, comprising four males and three females, all holding doctoral degrees and with over ten years of teaching and research experience, except for one expert. Most experts (n = 4) were aged 50 to 59 years, two were 60 years or older, and one was under 40 years old. All the experts were married, and most were in senior academic ranks, including two Professors, one Associate Professor, two Senior Lecturers, and two Lecturer I.

The experts independently assessed the questionnaire's items for relevance, clarity, simplicity, and lack of ambiguity using a four-point rating scale. Higher scores (3 or 4) indicated that the item was relevant, clear, simple, and unambiguous, while lower scores (1 or 2) suggested otherwise. Their ratings were converted into binary data, where ratings of 3 or 4 were coded as 1, indicating a satisfactory item, and ratings of 1 or 2 were coded as 0, indicating an unsatisfactory item. These ratings were analysed using quantitative content validity methods to compute the Item Content Validity Index (I-CVI) and Scale Content Validity Index (S-CVI), following established guidelines (Owan et al., 2022, 2023).

2.3. Qualitative grounding

The investigators organised a Focus Group Session involving 10 university lecturers. The participants comprised six lecturers from the University of Calabar and four from the University of Cross River State. The primary objective of the session was to collect qualitative perspectives regarding the survey items. During the session, the lecturers were given hard copies of the survey for completion, review, and discussion. Open-ended questions prompted the participants to express their thoughts on the items' relevance, clarity, and comprehensibility. The survey items underwent further revisions to address the concerns and recommendations raised by the lecturers. This involved refining item wording, elucidating ambiguous elements, and considering the potential reduction of the overall scale length, among other adjustments.

2.4. Pilot testing

Before starting the pilot study, considerable effort was made to ensure that the sample size would be adequate for reliable and meaningful results. Confirmatory factor analysis (CFA), a core aspect of the study, required a large enough sample to satisfy statistical requirements. Scholars have offered different guidelines for determining sample size, taking into account factors such as the number of items and factors in the model and the level of precision needed. Some general recommendations suggest a minimum of 300 participants for CFA (Clark & Watson, 1995). Others propose ratios of respondents to items, such as 20 respondents per item (Kline, 2015), 10 respondents per item (Schreiber et al., 2006), or 5 respondents per item (Bentler & Chou, 1987). For this study, data were collected from 3,145 lecturers, which provided a sufficiently large sample to allow for resampling into smaller subsamples where necessary.

2.5. Exploratory data analysis

Exploratory data analysis was carried out on the pilot data to confirm its readiness for further analysis. A review for missing values showed that all questionnaires were completely filled out. Normality was assessed using histograms, Shapiro-Wilk’s and Kolmogorov-Smirnov tests, as well as Q-Q plots. While minor departures from normality were noted in the histograms of some items, most displayed a bell-shaped distribution or were close to it. The results of the Shapiro-Wilk and Kolmogorov-Smirnov tests were mostly non-significant, with only a few exceptions. Boxplots revealed no univariate outliers; however, the Mahalanobis Distance Test flagged 23 multivariate outliers. These cases were excluded, reducing the sample size from 3,145 to 3,122 valid responses. Descriptive statistics, including mean, standard deviation, skewness, and kurtosis, were then computed.

Mean scores ranged from 2.81 to 3.18, reflecting a moderate level of agreement or endorsement of the items by respondents, based on the five-point Likert scale. The standard deviation values, which ranged from 1.36 to 1.51, suggested a moderate spread of responses around the mean. Skewness values were between -0.17 and 0.20, while kurtosis values ranged from -1.45 to -1.19, both of which were within acceptable limits (-3 to +3 for skewness and -10 to +10 for kurtosis) as outlined by Brown (2015). These findings confirm that the LJSQ is appropriate for further analysis and interpretation.

2.6. Subsampling procedure

The total sample was systematically divided into three subsamples to meet the specific requirements of different statistical analyses. Recommendations from existing literature regarding respondent-to-item ratios guided this allocation. For Exploratory Factor Analysis (EFA), a ratio of 10 respondents per item was adopted, a widely used guideline for factor extraction. With 26 items in the questionnaire, a minimum of 260 participants was required. To ensure sufficient statistical power, 262 lecturers were included in this subsample. Confirmatory Factor Analysis (CFA) required a larger sample size, following a respondent-to-item ratio of 20:1 as recommended in several studies. Although a minimum of 520 participants was necessary, 1,300 lecturers were allocated to strengthen the reliability of the analysis. Similarly, bifactor modelling, which demands large samples for stable parameter estimates, also utilised the 20:1 ratio. While a minimum of 520 participants was needed, a total of 1,560 lecturers were assigned to this subsample to enhance the robustness of the analysis. These allocations were made in alignment with established guidelines to ensure the validity and reliability of all statistical tests conducted.

A systematic approach was employed to allocate participants evenly across the three subsamples. Responses were organised in a spreadsheet, and participants were assigned sequentially: the first to the EFA subsample, the second to the CFA subsample, and the third to the bifactor modelling subsample. This rotation continued until the EFA subsample reached its target of 262 participants. Once this quota was filled, the remaining participants were allocated alternately between the CFA and bifactor modelling subsamples to achieve their required sizes. This method ensured an equitable and systematic distribution of respondents, adhering to statistical recommendations and contributing to the reliability of the study's findings.

3. Results

3.1. Participants demographics

The study included 3,122 lecturers, and their demographic information is presented as follows: 51.6% (n = 1,611) were male, while 48.4% (n = 1,511) were female. In terms of age distribution, 26.7% (n = 834) were under 40 years, 24.2% (n = 755) were between 40 and 49 years, 21.4% (n = 667) were aged 50 to 59 years, and 27.7% (n = 865) were 60 years or older. Educational qualifications showed that 54.4% (n = 1,699) held master's degrees, and 45.6% (n = 1,423) had doctorate degrees. Academic ranks were as follows: 18.9% (n = 589) were Assistant Lecturers, 14.7% (n = 459) were Lecturer II, 19.3% (n = 603) were Lecturer I, 13.7% (n = 427) were Senior Lecturers, 20.4% (n = 637) were Associate Professors, and 13.0% (n = 406) were Professors.

3.2. Content validity

The results of the content validity analysis are summarised in Table 1. The computed I-CVIs and S-CVIs across all variables, evaluating relevance, clarity, simplicity, and ambiguity, were found to be acceptable. This indicates that the LJSQ items adequately met the required standards for measuring the intended constructs.

Table 1 Item- and Scale-content validity indices for job satisfaction variables (n = 7).

	Basis	Work conditions	Remuneration	Workload	Career Advancement	Research Support
I-CVIs	Relevance	0.83 – 0.99	.83 – .99	0.83 – 0.99	0.99 (all items)	0.99 (all items)
	Clarity	0.83 – 0.99	.99 (all items)	0.83 – 0.99	0.99 (all items)	0.99 (all items)
	Simplicity	0.83 – 0.99	99 (all items)	0.83 – 0.99	0.99 (all items)	0.99 (all items)
	Ambiguity	0.83 – 0.99	99 (all items)	0.83 – 0.99	0.99 (all items)	0.99 (all items)
S-CVIs	Relevance	0.95	0.91	0.95	0.99	0.99
	Clarity	0.96	0.99	0.98	0.99	0.99
	Simplicity	0.94	0.99	0.96	0.99	0.99
	Ambiguity	0.96	0.99	0.96	0.99	0.99

Note: I-CVIs of 0.70 or above suggest that the item has an acceptable rating (with 70% or more of the experts' agreement). Values between 0.50 to 0.69 suggest that the items need revisions; Values below .50 indicate less than 50% of experts' agreement, suggesting that such items should be discarded.

3.3. Exploratory factor analysis (EFA)

Exploratory Factor Analysis (EFA) was performed on the data from the first subsample (n = 262) using the Principal Axis Factoring (PAF) extraction method with varimax rotation. The analysis was conducted to extract factors with Eigenvalues greater than one. In the initial analysis, 11 factors were extracted, accounting for 58.9% of the total variance. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.765, and Bartlett's test of sphericity was significant, $\chi^2(780) = 9848.14$, $p < 0.001$. Upon reviewing the rotated factor matrix, it was noted that three factors had no items loading onto them. In addition, the following items did not load onto any factor: WLO2, RSU7, WCON1, CAO6, WLO8, WCON6, CAO1, REM3, REM5, WLO4, RSU6, and RSU3. Some items, including WCON2, REM6, and RSU2, were found to load onto three separate factors. After excluding the problematic items, the analysis was repeated, resulting in a KMO value of 0.88, with Bartlett's test still significant, $\chi^2(276) = 7140.61$, $p < 0.001$. This time, five factors emerged, each with Eigenvalues greater than one, explaining a cumulative total of 80.54% of the variance (See Figure 2).

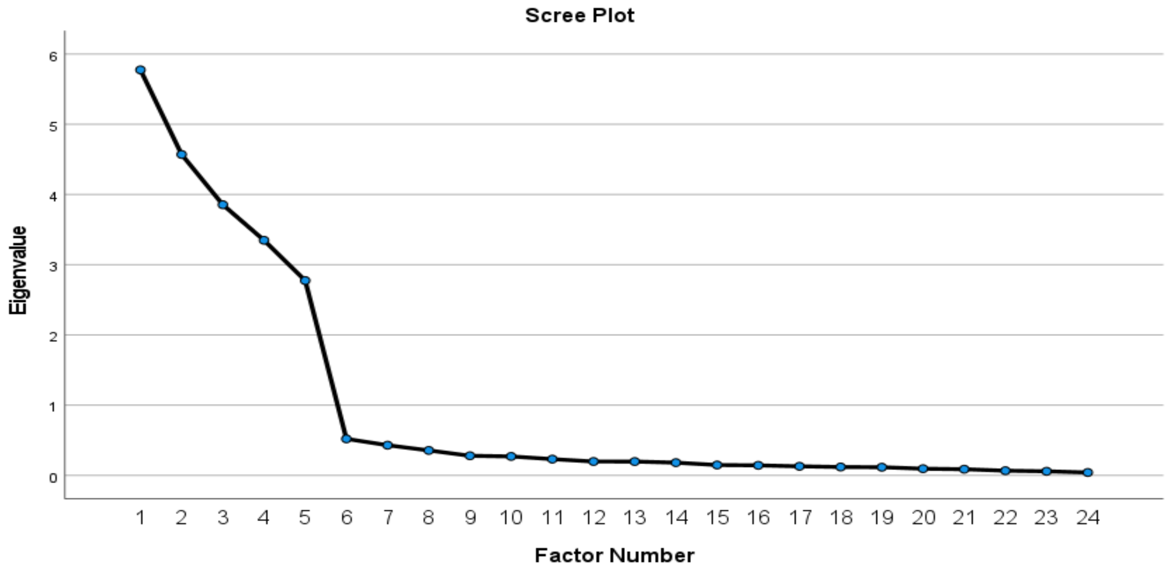

Figure 2 Scree plot showing the factors in the LJSQ with their Eigenvalues.

Factor 1 accounted for 23.61% of the variance, while factors 2, 3, 4, and 5 explained 18.43%, 15.15%, 13.15%, and 10.20%, respectively. Based on the rotated factor matrix, the five factors were named satisfaction with career advancement opportunities, workload allocation, remuneration, research support, and work conditions. The complete results of the EFA are presented in Table 2.

3.4. Confirmatory factor analysis (CFA)

Confirmatory Factor Analysis (CFA) examines the relationship between variables and their theoretical factors, determines model acceptability, and verifies the dimensionality of psychological instruments (Owan et al., 2021; Ekpenyong et al., 2022). Compared to EFA, CFA is considered more robust due to its ability to compare different models and identify the best-fitting model using fit indices like CFI, TLI, and RMSEA (Bassey et al., 2019; Bean & Bowen, 2021; Wilson et al., 2020).

This study used four competing CFA models to determine the best-fitting model based on the data from the second subsample (n = 1300). The four competing models were compared across the three instruments – ASEIQ, LJSQ and PPQ. These models include the single-factor model (Model 1), the oblique or correlated factor model (Model 2), the hierarchical or second-order factor model (Model 3) and the Bifactor model (Model 4). These models are described in an already-published work (Luo et al., 2023; Owan et al., 2023). The four competing CFA models of the LJSQ are displayed in Figures 3, 4, 5 and 6. The result in Table 3 compares the four competing models of the LJSQ.

Table 4 shows that the single factor model revealed a significant Chi-Square index, $\chi2(275) = 4944.58$, $p < 0.05$). The RMSEA value of 0.255 and SRMR value of .255 are both above the recommended thresholds, suggesting a poor fit. The CFI value of 0.366 and TLI value of 0.309 also fall below the desired thresholds, further supporting a poor fit for this model. The oblique model has a significant Chi-Square value $\chi2(265) = 355.34$, $p < 0.05$. The RMSEA value of 0.036 and SRMR value of 0.026 met the recommended requirements, indicating a better fit. The CFI value of 0.988 and TLI value of 0.986 exceed the desired thresholds, further supporting a good fit for this model.

The second-order model shows a significant Chi-Square, $\chi2(271) = 364.23$, $p < 0.05$. The RMSEA and SRMR values of 0.036 and 0.053 met the recommended criteria for model acceptability, thus suggesting a good fit. The CFI and TLI values of 0.987 and 0.986 exceeded the desired thresholds, further supporting a good fit for this model. Lastly, the bifactor model has a $\chi2$ value of 308.76 at 250 degrees of freedom. The p-value was significant, suggesting a poor fit. However, the result may be taken lightly due to sampling issues always bordering on this index. Moreover, the RMSEA value of 0.030 and SRMR value of 0.019 are below the 0.08 requirements for model acceptability. Furthermore, the CFI value of 0.992 and TLI value of 0.990 exceed the required cut-off criteria, further supporting the superior fit of the bifactor model.

Table 2 Loadings of Exploratory Factor analyses for the LJSQ (n = 262).

Factors	Item Label	λ	λ2	ε	z
Satisfaction with Career Advancement Opportunities	CAO2	0.97	0.94	0.06	17.60
	CAO8	0.97	0.94	0.06	16.99
	CAO5	0.95	0.89	0.11	9.00
	CAO3	0.94	0.89	0.11	8.22
	CAO4	0.93	0.86	0.14	6.59
	CAO7	0.93	0.86	0.14	6.50
	SUM	5.68	5.38	0.62	64.90
Satisfaction with Workload Allocation	WLO3	0.96	0.91	0.09	11.11
	WLO6	0.93	0.87	0.13	7.32
	WLO7	0.93	0.87	0.13	7.09
	WLO1	0.92	0.85	0.15	6.23
	WLO5	0.92	0.84	0.16	5.91
	SUM	4.66	4.35	0.65	37.67
Satisfaction with Remuneration	REM1	0.91	0.84	0.16	5.55
	REM8	0.89	0.79	0.21	4.24
	REM2	0.89	0.79	0.21	4.16
	REM4	0.87	0.75	0.25	3.49
	REM7	0.67	0.45	0.55	1.22
	SUM	4.23	3.61	1.39	18.66
Satisfaction with Research Support	RSU1	0.93	0.86	0.14	6.69
	RSU4	0.91	0.84	0.16	5.55
	RSU8	0.88	0.78	0.22	4.01
	RSU5	0.88	0.77	0.23	3.73
	SUM	3.60	3.24	0.76	19.98
Satisfaction with Work Conditions	WCON5	0.83	0.69	0.31	2.69
	WCON7	0.81	0.66	0.34	2.38
	WCON4	0.79	0.63	0.37	2.14
	WCON8	0.78	0.61	0.39	2.02
	SUM	3.22	2.59	1.41	9.23

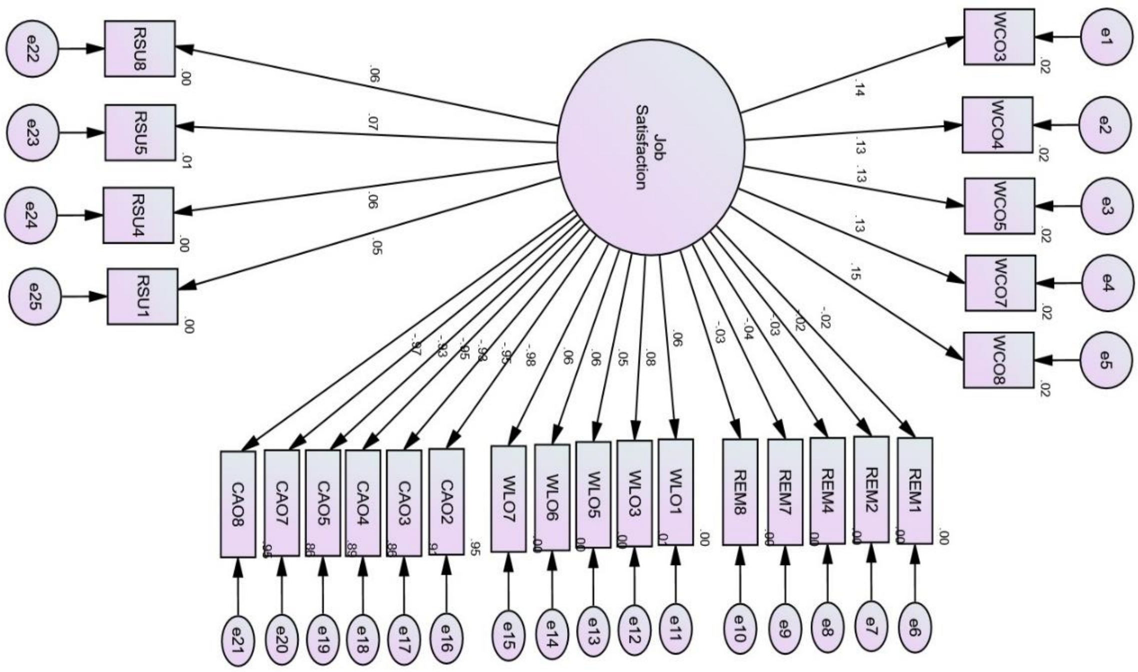

Figure 3 Standardised Single Factor CFA Model of the LJSQ. *Source:* AMOS output.

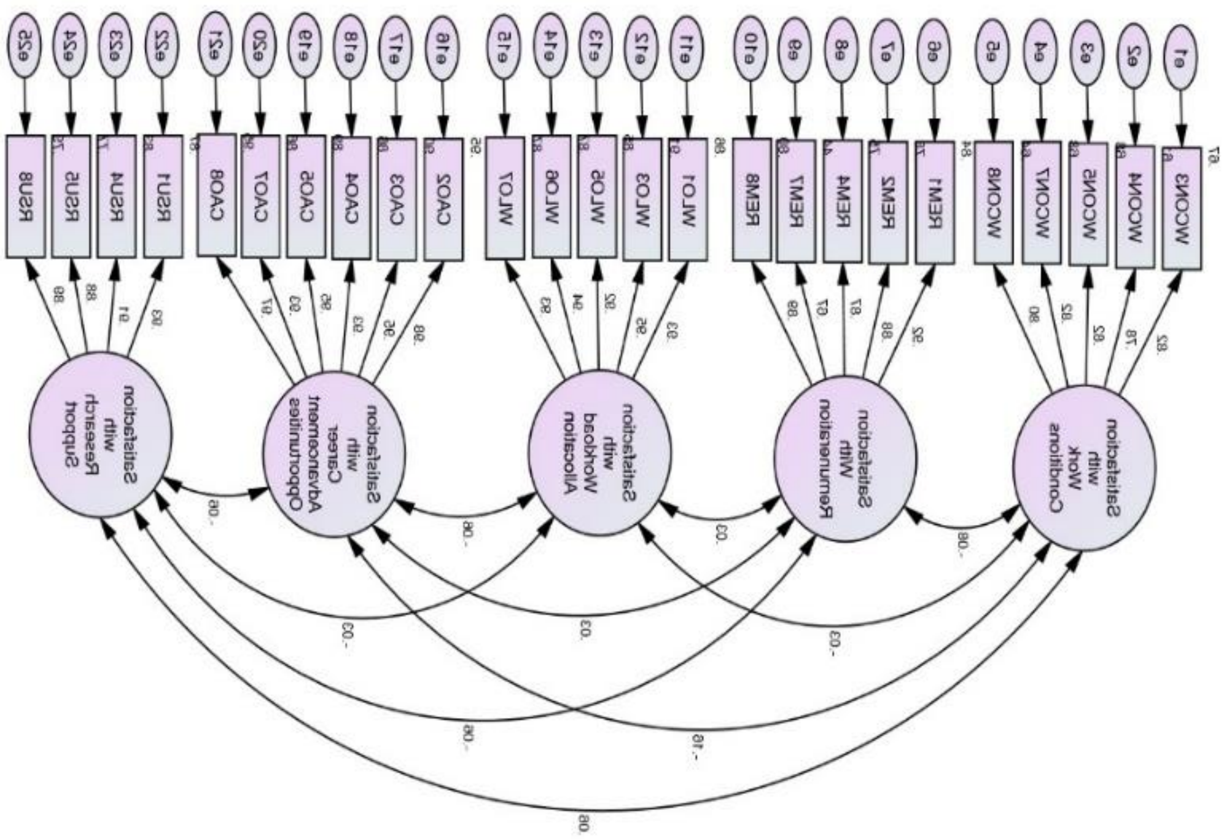

Figure 4 Standardised Oblique CFA model of the LSQ.

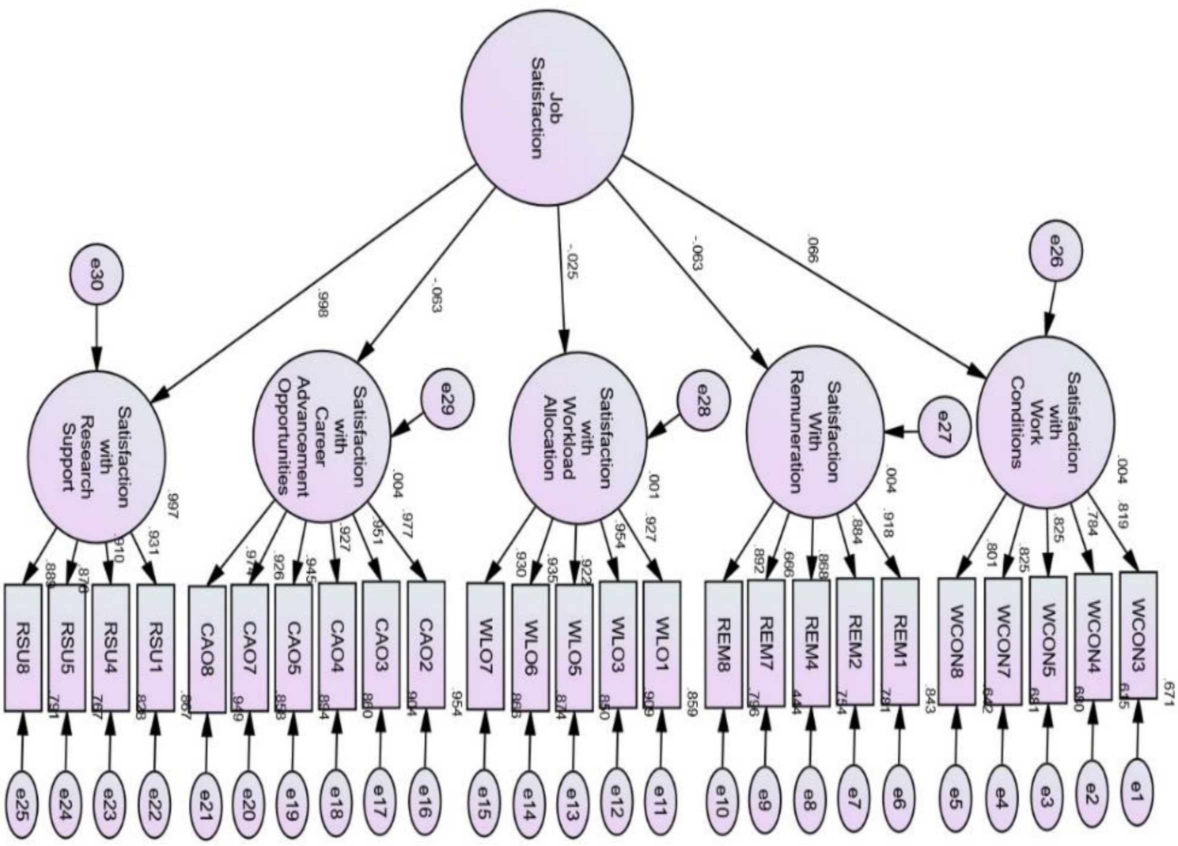

Figure 5 Standardised Second-order CFA Model of the LJSQ. *Source:* AMOS output.

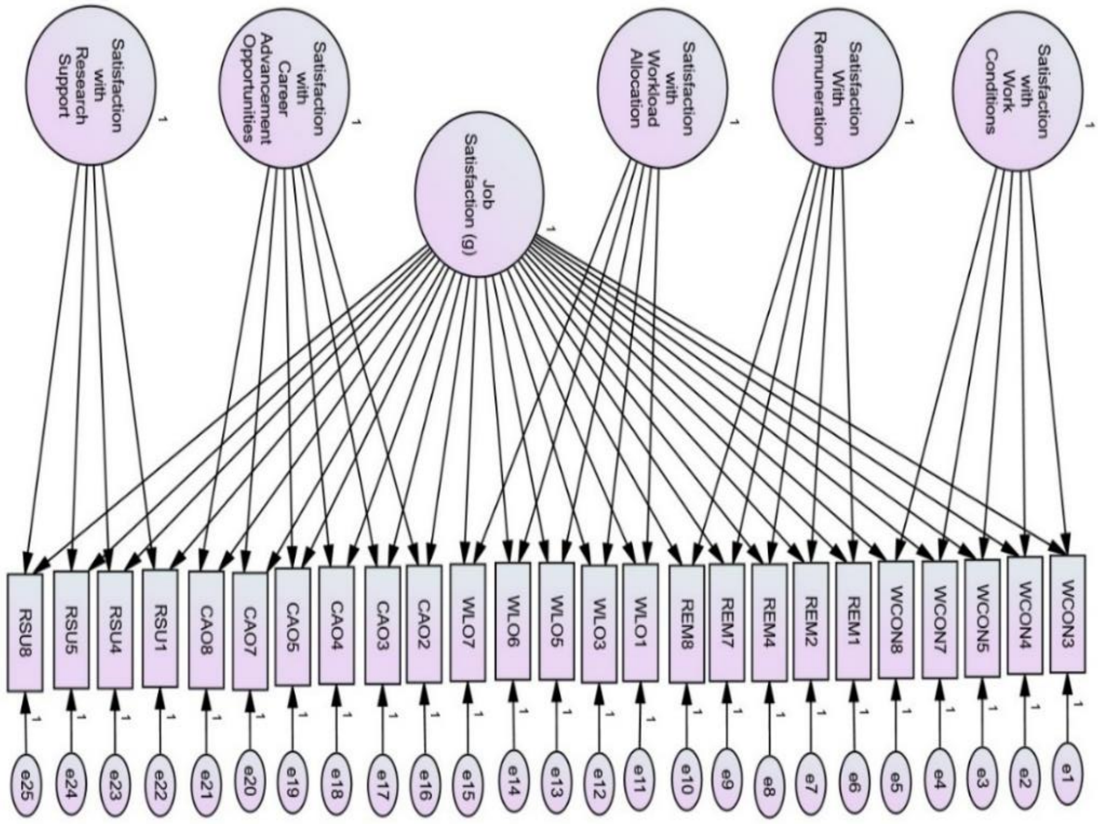

Figure 6 Standardised bifactor CFA model of the LJSQ.

Table 3 Standardised confirmatory factor analysis loadings for the single, oblique, second-order and bifactor models of the LJSQ (n = 1300).

Items	Single Factor Model	Oblique or Correlated Factor Model					(Schmid-Leiman transformation) Second-order Model						Bi-Factor or Nested Model					
	g	1	2	3	4	5	g	1	2	3	4	5	g	1	2	3	4	5
WCON3	0.14	0.82					0.05	0.81					-0.01	0.82				
WCON4	0.13	0.78					0.05	0.78					-0.01	0.78				
WCON5	0.13	0.83					0.05	0.82					0.00	0.82				
WCON7	0.14	0.83					0.05	0.82					0.00	0.83				
WCON8	0.15	0.80					0.05	0.80					0.00	0.80				
REM1	-0.02		0.92				-0.06		0.92				-0.01		0.92			
REM2	-0.02		0.88				-0.06		0.88				-0.02		0.88			
REM4	-0.03		0.87				-0.05		0.87				-0.03		0.87			

REM7	-0.04		0.67				-0.04		0.66				0.08		0.67			
REM8	-0.04			0.89			-0.06		0.89				-0.02		0.89			
WLO1	0.06			0.93			-0.02			0.93			0.75			0.54		
WLO3	0.08			0.95			-0.02			0.95			1.75			-0.75		
WLO5	0.05			0.92			-0.02			0.92			0.74			0.55		
WLO6	0.06			0.94			-0.02			0.94			0.75			0.56		
WLO7	0.06			0.93			-0.02			0.93			0.74			0.58		
CAO2	-0.98				0.98		-0.06				0.97		-0.03				0.98	
CAO3	-0.95				0.95		-0.06				0.95		-0.03				0.95	
CAO4	-0.93				0.93		-0.06				0.92		-0.01				0.93	
CAO5	-0.95				0.95		-0.06				0.94		-0.03				0.95	
CAO7	-0.93				0.93		-0.06				0.92		-0.03				0.93	
CAO8	-0.97				0.97		-0.06				0.97		-0.02				0.97	
RSU1	0.06					0.93	0.93					0.00	0.02					0.93
RSU4	0.06					0.91	0.91					0.00	0.03					0.91
RSU5	0.07					0.88	0.87					0.00	0.02					0.88
RSU8	0.06					0.89	0.89					0.00	0.02					0.89
Latent S^2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
λ (unique)								1.00	1.00	1.00	1.00	0.00						
λ (Second) order								0.07	-0.06	-0.03	-0.06	1.00						

Notes: 1 = Work conditions; 2 = Remuneration; 3 = Workload allocation; 4 = Career advancement opportunities; 5 = Satisfaction with research support

Table 4 Comparison of the four competing models across the three instruments (n = 1,300).

Model	χ^2(df)	RMSEA	SRMR	CFI	TLI
Single factor	4944.58(275), $p < 0.05$	0.255	0.255	0.366	0.309
Oblique	355.34(265), $p < 0.05$	0.036	0.026	0.988	0.986
Second-order	364.23(271), $p < 0.05$	0.036	0.053	0.987	0.986
Bifactor	308.76(250), $p < 0.05$	0.030	0.019	0.992	0.990
Recommended Benchmarks	$p > 0.05$	< 0.08	< 0.08	≥0.95	≥0.95

Based on these interpretations, the single-factor model of the LJSQ demonstrated poor fit, while the oblique, second-order, and bifactor models exhibited better fit. The bifactor model showed the best fit among the four competing models, with the lowest RMSEA and SRMR values and the highest CFI and TLI values. The poor fit indicated by the high RMSEA, SRMR, CFI, and TLI values suggests that the assumption of a single underlying factor for job satisfaction may not adequately capture the complexity of the construct as measured by the LJSQ. However, the oblique, second-order, and bifactor models demonstrated progressively better fit than the single-factor model. Among these models, the bifactor model showed the best fit, indicating that a common job satisfaction factor might be shared by all items and specific factors representing unique dimensions or aspects of job satisfaction.

3.5. Bifactor modelling

The bifactor model demonstrated the best fit among four competing confirmatory factor analysis (CFA) models based on conventional fit indices, including RMSEA, Chi-Square, SRMR, TLI, and CFI. However, exclusive reliance on the traditional indices in structural equation modelling (SEM) may result in false positives, as they do not adequately capture the contributions of general and specific factors to individual items. Critiques have emphasised the shortcomings of traditional goodness-of-fit indices, which tend to favour bifactor models statistically. To overcome these limitations, alternative approaches and indices that explicitly account for the effects of general and specific factors are necessary for a more thorough evaluation of model fit and validity (Owan et al., 2023).

Auxiliary measures were utilised to enable the researchers to gauge the reliability and acceptability of the bifactor model based on the data from the third subsample (n = 1,560). The "BifactorIndicesCalculator" Excel package (Dueber, 2017) generated indices based on results from the AMOS program, reported in Table 4. These include Omega Coefficients, Explained Common Variance (ECV), Percentage of Uncontaminated Correlations (PUC), Factor Determinacy (FD), Construct Replicability (H), and Average Relative Parameter Bias (ARPB). Various publications have described these measures (Rodriguez et al., 2015; Ventura-León et al., 2021).

Table 5 illustrates that the general factor's Omega coefficient for the LJSQ is 0.98, indicating high internal consistency across subscales. However, unidimensionality was not achieved for the general factor, with ωH at 0.20, suggesting the instrument is multidimensional in measuring job satisfaction. Subscale-level ωH values above 0.80 indicate that items within each factor measure dominant traits.

ECV values of 0.233 for each instrument are below the recommended 0.60 threshold, supporting the instrument's multidimensionality at the scale level. The IECV values also strongly support the bifactor model by being below the 0.85 threshold. FD coefficients meeting recommended benchmarks support the bifactor model's choice, allowing for general factor score estimation. Additionally, H values exceeding 0.70 for the LJSQ and all subscales indicate well-defined instruments likely to be stable in other studies. ARPB values outside the recommended range (1.10 for LJSQ) further support the multidimensional bifactor model's appropriateness for the instrument.

Table 5 Evaluation of the Dimensionality of the Bifactor CFA Models of the LJSQ through Auxiliary Fit Measures (n = 1,560).

Dimensions	ECV (S&E)	ECV (NEW)	ω/ω_S	ω_H/ω_{HS}	Relative ω	H	FD
General Factor	0.23	0.23	0.98	0.20	0.21	0.78	1.00
Work conditions	0.15	1.00	0.91	0.91	1.00	0.91	0.95
Remuneration	0.16	1.00	0.93	0.93	1.00	0.94	0.97
Workload	0.08	0.25	1.10	0.90	0.09	0.76	0.98
Career Advancement	0.24	1.00	0.98	0.98	1.00	0.99	0.99
Research support	0.14	1.00	0.95	0.95	1.00	0.95	0.97
IECV = 0.16 to .84; PUC = 0.830; ECV = .233; ARPB = 1.10							

Notes: ω = Omega; ωH = Omega Hierarchical; ωS = Omega for Specific factors; ωHS = Omega hierarchical for the subscales; H = Construct Replicability; FD = Factor Determinacy; IECV = Item Explained Common Variance; PUC = Percent of Uncontaminated Correlations; ECV = Explained Common Variance (ECV), Average Relative Parameter Bias (ARPB). For unidimensionality of the general or subscales: ω > 0.80; ωH > 0.80; ωS > 0.80; ωHS > 0.80; H > 0.80; FD > 0.90; IECV > 0.80; PUC > 0.70; ECV > 0.60; ARPB = .012 to 0.15.

3.6. Construct validity (convergent and discriminant) and reliability

Table 6 presents the LJSQ's construct validity result. The Average Variance Extracted approach was used, with values above 0.50 providing evidence of convergent validity (Rönkkö & Cho, 2022; Owan et al., 2022). The AVE values for all factors in the LJSQ range from 0.65 to 0.90, which are above 0.50, indicating good convergent validity. The PPQ also achieved convergent validity since the range of AVE values is 0.63 to 0.94, above the cut-off value of 0.50.

The instruments were also assessed for discriminant validity using the Fornell-Larcker approach (Fornell & Larcker, 1981). In this approach, the Average Variance Extracted (AVE) square root is computed for each factor, and these values are compared with the correlation estimates off the diagonal. For discriminant validity to be achieved, the square root of the AVE for each factor should be greater than the correlation estimates between that factor and other factors (off-diagonal correlations). This result indicates that each factor shares more variance with its measures than with measures of other factors (Owan et al., 2022). As shown in Table 6, all the bolded values are greater than the correlation coefficients, suggesting that discriminant validity is achieved for all the factors across the three instruments.

Reliability for the three instruments was assessed using four internal consistency measures: Composite reliability (CR), Cronbach alpha (α), MacDonald's Omega (ω), and Split-half reliability with Spearman-Brown correction (rtt). These methods, chosen for their varied strengths and weaknesses, offer a comprehensive view of instrument reliability. The LJSQ, featuring factors like satisfaction with career advancement, workload allocation, remuneration, research support, and work conditions, displayed robust internal consistency in Table 6. CR estimates ranged from 0.88 to 0.98, Cronbach's α values were 0.91 to 0.98, and MacDonald's ω reliability estimates were 0.90 to 0.98, all indicating strong reliability. Split-half reliability with Spearman-Brown correction (rtt) values ranged from 0.80 to 0.98, affirming substantial internal consistency across factors.

Table 6 Construct validity and reliability indications for the sub-scales in the LJSQ (3,122).

Factors	AVE	CR	α	ω	r_{tt}	1	2	3	4	5
1. Career Advancement	0.90	0.98	0.98	0.98	0.98	0.95				
2. Workload Allocation	0.87	0.97	0.97	0.97	0.98	-0.06	0.93			
3. Remuneration	0.72	0.93	0.94	0.94	0.95	0.03	.004	0.85		
4. Research Support	0.81	0.94	0.95	0.95	0.95	-0.07	-0.03	-0.06	0.90	
5. Work Conditions	0.65	0.88	0.91	0.91	0.90	-0.16	-0.02	-0.08	0.07	0.80

Notes: AVE (Average variance extracted; > 0.50 indicates convergent validity), CR (Composite reliability estimates; > 0.70 are acceptable), α (Cronbach alpha reliability estimates; > 0.70 indicates acceptable internal consistency), ω (MacDonald's Omega Reliability estimates; > 0.70 indicates acceptable internal consistency), rtt (Split-half reliability corrected with Spearman-Brown prophecy formula; > 0.70 indicates acceptable internal consistency). Bolded values represent the square roots of AVE. The square root of AVE should exceed correlation estimates off-diagonal for discriminant validity.

4. Discussion

This study addressed a critical gap by developing and validating the Lecturers' Job Satisfaction Questionnaire (LJSQ), tailored to the unique context of Nigerian universities. The findings affirm that job satisfaction among university lecturers is a multidimensional construct, consistent with existing literature (Basol, 2016; Bowling et al., 2018; Moumtzoglou, 2010), though contrary to studies suggesting a unidimensional view (e.g., Ho & Au, 2006). The conceptualisation of job satisfaction as encompassing affective, cognitive, and behavioural dimensions aligns with contemporary frameworks (Lee et al., 2016; Özpehlivan & Acar, 2016; Pepe et al., 2017). The integration of intrinsic and extrinsic sources further clarifies the complex nature of lecturers' satisfaction, helping to explain the five underlying factors identified.

A key contribution of this study lies in its cultural and contextual sensitivity. Existing instruments often overlook the specific experiences of African academics. The LJSQ addresses this gap, offering a tool that captures the lived realities of Nigerian lecturers. This supports calls for context-specific instruments in underrepresented regions (Schulze, 2006; Toit & Klerk, 2023). By focusing on career advancement, workload, remuneration, research support, and work conditions, the LJSQ highlights salient factors influencing job satisfaction in higher education; findings consistent with prior studies (Pepe et al., 2017). The confirmatory factor analysis further supports the robustness of the instrument, with the Bifactor Model outperforming alternative models. This approach affirms the presence of both general and domain-specific satisfaction factors, echoing recent methodological trends (Owan et al., 2023; Rodriguez et al., 2015; Ventura-León et al., 2021) and reinforcing the limitations of unidimensional models (Cho & Castañeda, 2019; Dheer & Castrogiovanni, 2023).

The LJSQ offers a validated tool for researchers and practitioners to investigate and address job satisfaction more precisely. It supports evidence-based interventions to enhance lecturer well-being and institutional effectiveness. Moreover, the methodological approach adopted here can guide the development of culturally grounded instruments in other contexts, thereby extending its relevance beyond the Nigerian academic environment.

However, some limitations should be acknowledged. First, the possibility of Differential Item Functioning (DIF) across diverse groups warrants further investigation to strengthen cross-group validity. Second, measurement invariance across demographic variables was not examined; future studies should address this to ensure generalisability. Third, concurrent and predictive validity were not tested—key areas for further research. Lastly, although internal consistency was established, test-retest reliability remains to be assessed. Despite these limitations, this study lays a foundation for future work on cross-cultural validation, longitudinal tracking, intervention studies, and comparative analyses across disciplines and institutions. By addressing these directions, researchers can deepen understanding of academic job satisfaction and refine the LJSQ's applicability across settings.

5. Final Considerations

The development and validation of the LJSQ have responded to critical gaps in existing instruments, offering a culturally attuned and multidimensional approach to assessing job satisfaction among African lecturers. Beyond the methodological contributions, this study carries substantial implications for the academic community and higher education institutions. The LJSQ provides a tailored tool to inform evidence-based policies and interventions to foster a conducive and supportive work environment for lecturers. Recognising the multidimensional nature of job satisfaction opens avenues for targeted strategies addressing specific aspects, ultimately enhancing the overall quality of education. Furthermore, the cultural sensitivity embedded in the LJSQ emphasises the importance of context in assessing job satisfaction, challenging the one-size-fits-all approach prevalent in existing instruments.

Importantly, while the LJSQ is rooted in the African academic context, its development process provides a replicable model for creating regionally grounded instruments across other cultural and professional settings. Institutions in similarly underrepresented or culturally distinct contexts—whether in Asia, Latin America, or other Global South regions—can adapt the approach to develop their own context-sensitive tools. Moreover, the LJSQ's emphasis on multidimensionality may inform broader organisational research beyond academia, especially in sectors where employee satisfaction is linked to productivity and retention. Thus, the LJSQ transcends its role as a research instrument; it serves as a catalyst for methodological innovation and positive systemic change within and beyond the academic sphere.

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Ethical Considerations

This study adhered to the principles of the Declaration of Helsinki. Ethical approval was obtained from the University of Calabar's Research Ethics Committee (approval number UC-IRB-2024-076). Informed consent was obtained from all participants, who were assured of the confidentiality of the data analysis. Participants agreed to have their responses used for publication under the condition of maintaining confidentiality.

Conflict of Interest

The authors declare no conflicts of interest.

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