

Vocal Hygiene Awareness and Voice Disorder Risk Among Call Center Operators: A Mixed-Method Study in Nairobi, Kenya

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ABSTRACT

Objectives: Research on the relationship between vocal hygiene awareness and risk of behavioral voice disorders among call center operators in Kenya is limited. Accordingly, this study examined this relationship in a sample of call center operators in Nairobi City County, Kenya.

Methods: A mixed-methods sequential explanatory design was implemented in this study, comprising quantitative and qualitative data collection. 130 call center operators were surveyed using structured questionnaires, whereas qualitative data were collected from 15 interviews and 3 focus group discussions consisting of 8 participants each. The association between vocal hygiene awareness and the risk of behavioral voice disorder was analyzed using Pearson's correlation and multiple regression. Thematic analysis was utilized to analyze qualitative data, providing supplemental information for the quantitative findings.

Results: The outcomes revealed a strong positive relationship ($\beta = 0.184$, $p = 0.006$) between vocal hygiene awareness and the risk of behavioral voice disorders. It was also found that workload and scheduling had a statistically significant relationship with increased risk of behavioral voice disorders ($\beta = 0.839$, $p < 0.001$). Contrastingly, workplace environment ($\beta = -0.098$, $p = 0.375$) and organizational support ($\beta = -0.118$, $p = 0.308$) demonstrated significant negative associations with the risk of behavioral voice disorders.

Conclusions: This study supports the relationship between vocal hygiene awareness and risk of behavioral voice disorders. However, it also finds that workload and scheduling are significant mediating factors in this relationship.

Contribution to Health Promotion

- Call center operators are at increased risk of behavioral voice disorders due to the vocal demands of their occupations.
- Workplace factors contribute to voice strain.
- This study found that a strong relationship between vocal hygiene awareness and risk of behavioral voice disorders among call center operators in Nairobi County.
- Workload and scheduling were found to influence the relationship between the vocal hygiene awareness and risk of behavioral voice disorders.
- This study supports the need for integrated interventions such as vocal hygiene training to enhance awareness and develop policies on voice use to improve vocal health among call center operators.

Keywords: Behavioral Voice Disorder; Vocal Hygiene Awareness; Call Center Operators; Occupational Voice Disorders; Vocal Fatigue

INTRODUCTION

Behavioral voice disorders are defined as voice problems caused by vocal misuse or abuse (Ribeiro et al., 2026). These disorders are structural and neurological-free, arising from destructive speech patterns. Such patterns may include improper breathing techniques, lack of hydration, and excessive shouting (Gurung et al., 2024). Research shows that symptoms of behavioral voice disorders may include hoarseness, vocal fatigue, effortful voice, pain in the throat, and cracks or breaks in the voice (Epstein, Remacle and Morsomme, 2011).

While behavioral voice disorders can affect the general population, research shows that they are more prevalent among voice professionals like singers and occupational voice users like teachers – about 50% of this population presents with such disorders (Martins et al., 2016). Call Center Operators (CCOs) are at a particularly high risk of developing behavioral voice disorders because they rely heavily on their voices in their occupation. CCO's job requirements of getting constant calls, which means speaking for long working hours with limited vocal rest and recovery, and tight performance targets on a daily basis, increase the risk of the occurrence of behavioral voice disorders (Nair et al., 2021). Also, research shows that the noisy environment, work stress, and dry work environment in which most CCOs work add pressure on their vocal cords and muscles, increasing the risk of vocal disorders (Chaudhary et al., 2023). The increased risk of behavioral voice disorders in this population necessitates exploration of preventive strategies.

Vocal hygiene awareness (VHA) refers to an individual's cognitive understanding and appreciation of behaviors, lifestyle choices, and environmental factors that can protect or harm their vocal mechanism, also known as vocal hygiene (VH) (Akgöl et al., 2022). According to the literature, VH practices include exercising proper hydration, practicing proper breathing techniques, and avoiding alcohol, smoking, and other substances that are considered harmful (Ribeiro et al., 2026). There is evidence suggesting that high levels of VHA can reduce the risk of developing behavioral voice disorders, although enhanced skills and motivation are also equally important to ensure practical application of VH practices in workplace settings (Nair et al., 2021). Despite these findings, there is a significant gap in research addressing the level of VHA among CCOs in Kenya and its potential role in the development or prevention of vocal disorders, even though the call center industry is growing fast in this region, and its resources might differ considerably from those in other geographical settings. Accordingly, this study seeks to address this gap in knowledge by investigating the current level of VHA among CCOs in Nairobi County and evaluating its relationship with the occurrence of behavioral voice disorders. Understanding this association is particularly important for developing targeted interventions and promoting vocal health in this rapidly expanding industry, ultimately improving the well-being and productivity of CCOs.

Research Question

Is there a significant relationship between levels of vocal hygiene awareness and the risk of behavioral voice disorders among Call Center Operators in Nairobi City County, Kenya?

Theoretical and Conceptual Framework

This study was informed by the Social Ecological Model, which postulates that health behaviors and outcomes result from interactions across multiple levels of influence, namely individual, interpersonal, organizational, community and political (Ingram et al., 2021). In this context, VHA represents an individual-level factor that could influence behavioral voice disorders. Contrastingly, factors such as working conditions, which have been found to influence voice disorders among professional and occupational voice users, operate at the organizational level. Based on the SEM framework, factors at different levels can contribute to the development or prevention of behavioral voice disorders.

Accordingly, a conceptual framework was developed to examine the connection between the level of VHA among CCOs (independent variable) and the risk of developing behavioral voice disorders (dependent variable) (Fig.1). The framework posits that the current level of VHA, including knowledge of proper vocal practices like adequate hydration, avoidance of phono-traumatic behaviors, and voice rest, influences the likelihood of CCOs experiencing behavioral voice disorders. However, it is also hypothesized that several intervening

variables influence this relationship, hence the inclusion of organizational factors. Figure 1 provides a diagrammatic representation illustrating the proposed relationship, clearly delineating the direct influence of the independent variable and the dependent variable and the mediating role of intervening variables.

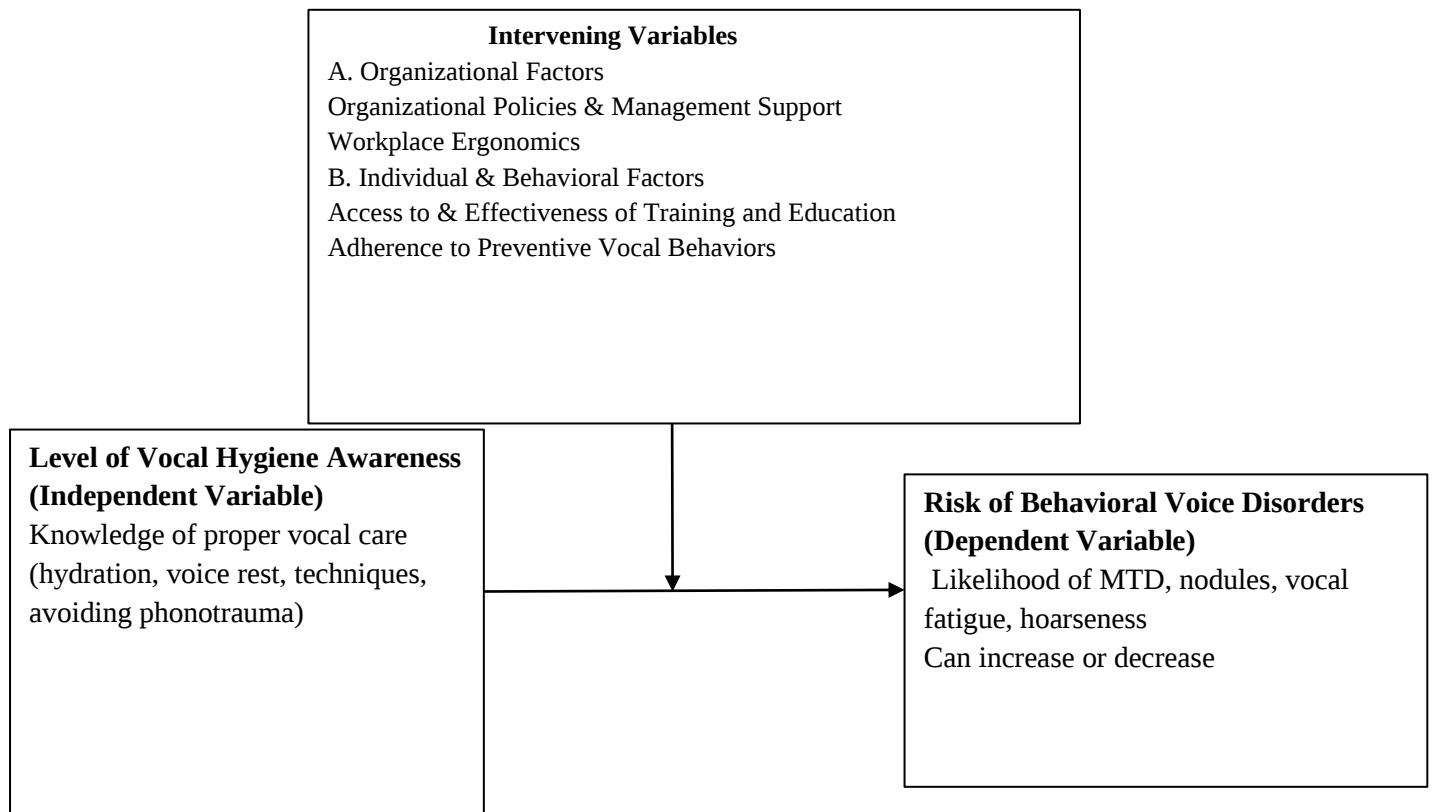


Fig.1: Conceptual Framework

METHODS

Study Participants

This study was conducted among 130 CCOs working in both inbound and outbound call centers. This sample size was determined using Cochran's sample size formula, assuming a 95% confidence level and a margin of error of 8.5%. Although a smaller margin of error would have yielded a larger sample size, which is ideal for quantitative studies, 8.5% was chosen because it generated a more feasible sample size given the resource and time constraints inherent in accessing and collecting data from diverse call centers. This sample size was considered adequate in determining the relationship between the study variables with reasonable statistical power.

A sequential explanatory mixed research design, comprising qualitative and quantitative research, was utilized. This approach was chosen because of its effectiveness in providing robust findings, including quantifiable trends, association between variables, and personal experiences of the research participants (Kottronoulas, 2023; Braun and Clarke, 2006). The first stage of the study utilized stratified random sampling and focused on collection of numerical data through structured questionnaires to identify the association between VHA and behavioral voice disorders, and it comprised 130 participants. This sampling technique was chosen to ensure the sample accurately reflected the broader call center workforce in Nairobi County.

The second phase utilized purposive sampling and involved the collection of descriptive data through interviews and focused group discussions (FGDs) to gather more information and personal experiences underlining those patterns. This sampling technique was appropriate in ensuring inclusion of individuals with specific experiences that were relevant to the study. The sample size for this qualitative phase was determined through the principle of data saturation which entails gathering data until there is no new or significant insights related to the study variables. Considering the principle of data saturation was important in ensuring the

qualitative data was rich and comprehensive to explain and add depth to the quantitative findings. Accordingly, fifteen participants were involved in the in-depth interviews while three FGDs with 8 participants each were conducted. The mixed approach to sampling used during the study helped ensure a representative selection of participants while also maintaining relevance to the study's objective.

Ethical Consideration

All participants provided informed consent to participate in the study by signing the consent forms. The study also adhered to ethical principles of confidentiality and anonymity. Additionally, the ethics review committee at Kenyatta University granted approval to conduct this study.

Study Variables

Independent Variable

The level of VHA was assessed using a self-administered structured questionnaire. A pilot study was conducted among 13 CCOs at a selected mixed call center in Nairobi County to evaluate the validity, clarity, and reliability of this instrument. The questionnaire responses from the pilot study were tested using Cronbach's Alpha, and the coefficient was greater than 0.7, indicating satisfactory internal consistency.

The questionnaire evaluated the participants' knowledge, attitudes, and awareness of practices that promote vocal health, including proper hydration, avoiding shouting, proper voice rest, proper breathing techniques, and avoiding excessive voice use. Each of these items was rated on a 5-point Likert scale, with response options ranging from 1 (strongly disagree) to 5 (strongly agree). The responses were then summed across all items to generate a composite score that was used for correlational analysis, with higher scores indicating greater levels of awareness and vice versa.

Dependent Variable

The risk of behavioral voice disorder was assessed through a questionnaire that evaluated self-reported frequency and severity of vocal symptoms experienced during or after work. Participants were asked to report the presence and frequency of vocal symptoms, including hoarseness, voice fatigue, loss of voice, or experiencing pain in the throat, and dry and strained voice. These items were scored and summed to generate a composite score for analysis.

Other Covariates

Workplace factors, including environmental conditions like job demands, organizational support, and ergonomic conditions, were hypothesized to intervene in the relationship between VHA and the risk of behavioral voice disorders. Therefore, these factors were assessed through questionnaires. Additionally, participants were asked to fill in their demographic characteristics, including age, gender, marital status, education level, years of experience, and type of call center. These characteristics served as control variables to help eliminate bias in the research findings.

Statistical Analysis

The quantitative data gathered from the structured questionnaires were analyzed using the Statistical Package of Social Sciences (SPSS) (Bala, 2016). This software was chosen because of its potential to enhance accuracy in statistical analysis while also minimizing human error that could occur during manual calculations (Olayiwola, Idowu and Sofadekan, 2022). Descriptive statistics were used to summarize participant characteristics and key study variables. These variables were presented as frequencies and percentages, while continuous variables were summarized using means and standard deviations. The relationship between variables was tested using inferential statistics. Correlation and chi-square test were used to determine significant associations between the variables. Findings from these tests helped establish the relationship between VHA and behavioral voice disorders.

Qualitative Data Analysis

Qualitative data obtained from FGDs and interviews were analyzed using thematic analysis, a widely used method for identifying, analyzing, and interpreting patterns of meaning within datasets (Ahmed et al., 2025). The process involved transcribing data gathered in the qualitative phase, coding, categorizing, and identifying themes within the datasets. Intercooder reliability was implemented by having different assistant researchers independently code the transcripts and compare results to ensure uniformity in data interpretation. Triangulation was also done to enhance the validity and credibility of the research findings (Meydan and Akkaş, 2024).

RESULTS

Participant Characteristics

One hundred and thirty questionnaires were issued to different call centers within Nairobi City County, and all were fully completed and returned, yielding an adequate response rate, which is important for enhancing the validity and reliability of the research study (Taherdoost and Madanchian, 2024). The majority of this sample were males (61.5%) vs. 38.5% females. Over three-quarters of the respondents (76.9%) held a bachelor's degree, with 15.4% and 7.7% of the sample holding a diploma and certificate, respectively, suggesting that a majority of CCOs are well educated.

Information on duration of service also revealed that a majority of the participants (70.8%) had experience of between one and three years in the call center, with only a few (4.6%) having more than three years of experience. On average, it was found that a majority of the respondents worked for long hours; almost three-quarters (73.1%) worked between 6 and 8 hours/day, with only 10% working 9-10 hours. Findings also revealed that a large number of the respondents were employed in inbound call centers (89.2%). Supplementary Table 1 shows these demographic and participant characteristics.

Association between vocal hygiene awareness and voice disorder risk

The strength and direction of the relationship between VHA and the risk of behavioral voice disorders were analyzed using correlation and regression analyses (Table 2). The outcomes revealed a strong positive relationship ($\beta = 0.184$, $p = 0.006$) between the two variables, indicating that higher levels of VHA were associated with a reduced risk of developing behavioral voice disorders. However, the outcomes also revealed a small beta ($\beta = 0.184$), suggesting that awareness cannot be used as a sole deterrent to behavioral voice disorders, further supporting the inclusion of intervening variables to better understand this relationship. Notably, it was found that among the assessed covariates, workload and scheduling had a statistically significant relationship with increased risk of behavioral voice disorders ($\beta = 0.839$, $p < 0.001$). Contrastingly, the workplace environment ($\beta = -0.098$, $p = 0.375$) and organizational support ($\beta = -0.118$, $p = 0.308$) demonstrated significant negative associations with the risk of behavioral voice disorders, suggesting that they could serve as protective factors (Table 3).

Table 2. Regression Coefficient for Vocal Hygiene Awareness and Behavioral Voice Disorders

Predictor	B	Std. Error	Beta	T	Sig. (p-value)
(Constant)	0.262	0.604	—	0.434	0.665
Vocal Hygiene Awareness	0.197	0.07	0.184	2.803	0.006

Table 3. Regression Results for Workplace-Related Predictors of Behavioral Voice Disorders

Predictor	B	Std. Error	Beta	T	Sig. (p-value)
(Constant)	0.262	0.604	—	0.434	0.665
Workplace Environment	-0.081	0.091	-0.098	-0.89	0.375

Workload and Scheduling	0.973	0.131	0.839	7.427	0
Organizational Support	-0.118	0.112	-0.118	-1.015	0.308

Model Summary: $R = 0.715$; $R^2 = 0.512$; Adjusted $R^2 = 0.492$; $F(5,124) = 26.012$; $p < 0.001$

The quantitative findings were further supported by qualitative data gathered through interviews and FGDs. The qualitative data revealed mixed levels of VHA among the participants. In particular, a significant number of CCOs reported having a basic understanding of voice care, such as hydrating and avoiding screaming, but some lacked any knowledge of voice preservation. The findings revealed the following themes:

Awareness and Informal Learning

The study revealed that a number of the respondents were knowledgeable about VH practices, while others relied on personal experience or advice from peers to cope with their voices.

“I hum before my shift or do some breathing because it relaxes my throat,” shared one participant. Another noted, *“When my voice gets rough, I use honey and lemon, but that’s just something I learned from friends.”* *“I know whispering is bad, so I try not to whisper, even when I’m tired,”* a third participant shared.

These findings suggested a basic level of VHA among participants based on informal knowledge gained from peers and colleagues, but a lack of depth in this knowledge, potentially due to a lack of formal training.

Lack of Formal Training or Guidance

The findings showed that a significant number of the participants had not received any institutionalized training in VH.

“We have never been trained on how to take care of our voices,” one participant shared, while another argued that, *“The only training we receive is on customer service, not voice use.”* *“I think everyone assumes we just talk naturally; nobody thinks of it as a skill,”* another one shared, while others stated that *“We should have training programs like singers do because we use our voices every day, too.”*

In the FGD, participants voiced similar frustrations: *“If we had a short voice care workshop, even once a year, many of us wouldn’t lose our voices so often,”* one participant shared. *“I didn’t even know you could strain your voice until I started this job,”* another participant shared.

These findings support the hypothesis that VHA may not be solely effective in reducing the risk of behavioral voice disorders in the long-term. Without formal training, support, and guidance in the workplace, it may be difficult for CCOs to practice proper voice hygiene.

Personal Responsibility and Self Efficacy

The findings revealed that some participants expressed a personal obligation to protect their vocal health.

One participant shared, *“Even if the company doesn’t care, I still take care of myself because I need this job.”*

This finding indicates self-efficacy on the part of the CCOs, which is an individual-level determinant of vocal health.

DISCUSSION

This study found that VHA is significantly associated with the risk of behavioral voice disorders among CCOs in Nairobi City County, Kenya, with lower levels of VHA associated with an increased likelihood of developing behavioral voice disorders. This finding aligns with previous studies conducted on other professional and occupational voice users, including teachers and singers, although the relationship has yielded mixed results. For example, Bolbol et al. (2017) found that increased awareness of healthy voice use among

Egyptian teachers had the potential to minimize the risk of permanent impairments in their voices or disability. Similarly, Pomaville et al. (2019) found that vocal performers who participated in VH education programs demonstrated increased awareness and knowledge of VH, which translated into healthier vocal practices such as decreased caffeine intake and improved hydration. Like in a previous study conducted by Pomaville et al. (2019), the association found in the present study may be explained using behavioral mechanisms whereby individuals with high awareness of VH are more likely to adopt proper vocal behaviors like avoiding shouting, practicing proper hydration, exercising vocal rest, and spotting early signs of behavioral voice disorders, which can lead to early intervention or help-seeking. Contrastingly, those with low levels of awareness may not engage in such protective practices, leading to continuous misuse and abuse of their voices, which could lead to behavioral voice disorders.

However, some studies contend that education or awareness does not always translate into better voice practices or a reduced risk of behavioral voice disorders (Broadus-Lawrence et al., 2000; Nallamuthu et al., 2021). Arguably, while some occupational voice users may be knowledgeable about VH, they may not integrate proper VH behaviors into their everyday practice due to individual factors, such as a lack of motivation and work-related factors like job demands. This aspect is demonstrated in the present study, which showed a small beta for the association between VHA and voice disorder risk, suggesting that awareness alone may not be sufficient to fully mitigate voice disorders; other factors, such as workplace context, matter considerably in reducing these risks. This finding also cements the initial perception that awareness is an individual-level factor; but in the absence of assistance from other levels like organizational, community, and policy, even those well-informed might find themselves unable to take action.

In the conceptual framework of this study, work-related factors, such as working conditions, were conceptualized as contextual variables that could potentially influence vocal outcomes. While these covariates were not the primary focus of the analysis, the study found a statistically significant relationship between workload and scheduling and an increased risk of behavioral voice disorders, with the workplace environment and organizational support demonstrating negative associations with vocal health outcomes. These findings, coupled with the small beta in the association between awareness and vocal health, suggest that work-related factors are contextual determinants that influence behavioral voice disorders and should thus be considered alongside awareness in this case. Arguably, these factors can compound or reduce the risk of behavioral voice disorders. For example, even for individuals with high levels of VHA, the risk of behavioral voice disorders may be high if they are exposed to increased workloads and tight scheduling that lead to prolonged speaking hours and limited vocal rest. Similarly, these work-related conditions may exacerbate the risk of behavioral voice disorders among individuals with low VHA. Therefore, VHA and work-related factors, which are conceptualized as organizational-level factors, work together to influence vocal health.

This study also found that while a number of participants were knowledgeable about VH, they had acquired this knowledge through informal channels like personal experiences and advice from their peers. Previous studies have found limited knowledge of VH among occupational voice users, with many expressing a willingness to participate in educational and training programs to enhance their knowledge of vocal health (Maasz et al., 2024). This aspect was evident in the present study, in which participants had either partial or informal knowledge of VH. Most participants with this informal knowledge argued that some protective habits they adopted included drinking water, not shouting, or humming before shifts, although they also emphasized that no formal training had been offered in their workplaces on VH practices. A majority of the participants also argued that they could benefit significantly from formal training and guidance. This finding demonstrates the need for institutionalized education to help CCOs maintain their vocal health in the long term by promoting awareness and the adoption of protective behaviors.

A key strength of this study is that it was conducted only in selected call centers in Nairobi City County, which enabled a more in-depth, context-specific examination of the relationship between VHA and the risk of behavioral voice disorders, while accounting for relevant influencing factors such as workload, scheduling, organizational support, and work environment. However, this context-specific focus could limit the generalizability of the present findings to other geographical locations and populations, such as other occupational voice users. Also, the study relied on self-reported data from the participants, which could be

prone to bias (Akbulut, 2025), such as underestimation or exaggeration of symptoms or levels of awareness. Additionally, this study employed a cross-sectional design, which is well-suited to understanding the determinants of vocal health (Wang and Cheng, 2020).

Future studies, using a longitudinal design, are recommended to test the efficacy of structured voice training programs and workplace-related interventions in increasing VHA and reducing the risk of behavioral voice disorders among CCOs in Kenya. Comparative occupational studies are also needed to compare risk of behavioral voice orders in other occupational-voice users in Kenya including teachers. Further studies focusing on gender-specific voice research may also prove valuable in investigating possible varied vocal challenges between female and male CCOs working under similar work conditions.

CONCLUSION

This study highlights that the level of VHA is significantly associated with the risk of behavioral voice disorders and emphasizes the importance of improving CCOs' knowledge through formal, institutionalized education. The study also highlights that awareness is a limited tool if not reinforced by organizational support and policy changes, such as reduced workload, adequate rest time for vocal recovery and regulation of voice use. Accordingly, it is recommended that call centers provide regular workshops on vocal care, phonation techniques, and vocal recovery, facilitated by speech-language professionals to increase awareness and equip CCOs with knowledge of protective habits to promote their vocal health. Guidelines should also be developed at the organizational level on workload and shift scheduling to ensure CCOs have adequate vocal rest.

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Declaration of Interest

The author has no conflict of interest to declare

Author Contributions

Pollyann Mugo: Conceptualization, methodology, investigation, data curation, formal analysis, visualization, writing – original draft, review and editing.

Dr. Mathew Karia: Supervision, methodology guidance, validation, and writing – review and editing

Supplementary Data

Table 1. Demographic and Participants Characteristics

Variable	Category	n	%
Gender	Male	80	61.5%
	Female	50	38.5%
Age (years)	18-25	18	13.8%
	26-33	109	83.8%
	34-41	3	2.3%
Education Qualification	Certificate	10	7.7%
	Diploma	20	15.4%
	Bachelor's Degree	100	76.9%
Duration of Service	1-3 years	92	70.8%
	>3 years	6	4.6%
	<6 months	12	9.2%

	6 months to 1 year	20	15.4%
Working Hours per Day	<6hours	22	16.9%
	6-8 hours	95	73.1%
	9-10 hours	13	10%
Type of Call Center	Inbound	116	89.2%
	Mixed	6	4.6%
	Outbound	8	6.2%

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Workload and Scheduling	0.973	0.131	0.839	7.427	0
Organizational Support	-0.118	0.112	-0.118	-1.015	0.308

Data Availability Statement

Data underlying this article will be shared on reasonable request to the author.

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