

The Impact of Workplace Ergonomics on Employee Productivity, Comfort, and Health: A Mixed-Methods Study in the Department of State GST, Karnataka

¹Wilfred Dsouza, ^{2*}T.S. Harsha

¹Project Student, Department of Environmental Science, KSOU Mysore, ²Chairman, Department of Studies and Research in Environmental Science, KSOU Mysore

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Abstract

This study explores the influence of workplace ergonomics on employee productivity, comfort, and health in a governmental administrative context. A mixed-methods approach was applied, collecting data from 70 employees of the Department of State GST, Karnataka, through structured questionnaires, semi-structured interviews, direct observations, and Rapid Upper Limb Assessment (RULA). Findings reveal that while 80% of respondents were at least somewhat familiar with ergonomic principles, only 52.86% had made personal adjustments to their workspaces. Discomfort was prevalent, with 50% reporting mild discomfort and 21.43% moderate discomfort, primarily back pain (40%), neck pain (21.43%), and eye strain (18.57%). RULA assessments indicated medium to high ergonomic risks due to poor lumbar support, improper desk setups, and prolonged static postures. Over 62% believed that an ergonomic setup would significantly improve productivity, and 57.14% felt it would reduce health-related issues. However, 58.57% had never reported ergonomic concerns to management. The results highlight the need for policy-level ergonomic interventions, including adjustable furniture, structured break schedules, and targeted employee training, to enhance workplace efficiency and well-being.

Keywords: ergonomics, productivity, RULA, workplace comfort, occupational health, musculoskeletal disorders

Introduction

Ergonomics is the scientific discipline concerned with designing work environments, systems, and tasks to align with human physical and cognitive capabilities. Its primary goal is to enhance worker comfort, safety, and performance while reducing the risk of work-related musculoskeletal disorders (WMSDs)^[1]. Inadequate ergonomic design such as poorly positioned desks, non-adjustable chairs, suboptimal lighting, and repetitive static postures

has been linked to physical strain, fatigue, decreased productivity, and increased absenteeism^[2]. Over time, these issues can lead to chronic conditions that diminish both employee well-being and organizational efficiency.^[3]

In modern workplaces, where technology integration and sedentary roles are increasingly common, ergonomics plays a critical role in mitigating the adverse effects of prolonged computer use, repetitive movements, and constrained postures^[4].

Corresponding Author: T. S. Harsha, Chairman, Department of Studies and Research in Environmental Science, KSOU Mysore

E-mail: raoamer@gmail.com

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Research has shown that ergonomic modifications, including adjustable furniture, appropriate workstation layouts, and optimized environmental conditions, can significantly improve concentration, reduce fatigue, and boost productivity^[5]. Beyond physical health, ergonomics influences psychological factors such as job satisfaction, trust in management, and employee retention^[6]

Despite these recognized benefits, many organizations particularly in public sector administrative environments fail to implement comprehensive ergonomic strategies^{[7][15][16][17]}. This gap often stems from limited awareness, inadequate investment, or a lack of systematic evaluation of workplace conditions^[8]. In the Indian context, such neglect can be more pronounced in government departments where infrastructural upgrades are gradual and procedural.^{[9][18][19]}

The Department of State GST, Karnataka, provides a relevant case for examining these dynamics. Employees in this setting engage in prolonged desk work, data entry, and administrative tasks, making them susceptible to ergonomic risks^[10]. This study investigates the relationship between workplace ergonomics and employee productivity, comfort, and health in this context^{[11][20][21][22]}. By identifying common risk factors, evaluating posture through Rapid Upper Limb Assessment (RULA), and analyzing employee perceptions, the research aims to provide evidence-based recommendations to enhance both organizational performance and worker well-being^{[12][24]}. While numerous studies have explored the relationship between workplace ergonomics and employee outcomes such as productivity, comfort, and health, most existing research has been conducted in industrial, manufacturing, or corporate office settings. There is a notable lack of context-specific research **focusing on** government departments, particularly in India's public administrative **sectors** like the Department of State GST in Karnataka. The ergonomic challenges, work culture, and infrastructure in such departments differ significantly from those in the private sector, making generalizations problematic. Additionally, limited use of mixed-methods approaches in this

domain restricts a deeper understanding of both the quantifiable impacts and subjective experiences of employees. This study aims to fill this gap by providing empirical and narrative evidence from a public sector perspective, thereby contributing to more inclusive ergonomic policy recommendations^{[25][26][27]}.

Methodology

Research Design

This study adopted a **mixed-methods research design**^[13], integrating quantitative and qualitative approaches to provide a comprehensive analysis of workplace ergonomics. Quantitative data were collected through structured questionnaires and Rapid Upper Limb Assessment (RULA) scores, while qualitative data were obtained from semi-structured interviews and direct workplace observations. This combination enabled data triangulation, enhancing the validity and reliability of findings by cross-verifying evidence from multiple sources^[14].

Population and Sample

The research was conducted in the **Department of State GST, Karnataka**, encompassing employees across clerical, technical, supervisory, and managerial roles. A **stratified random sampling** technique was used to ensure representation across different job categories. The sample comprised **70 participants**, all of whom met the following criteria:

- A minimum of one year of continuous service.
- Regular exposure to ergonomic risks (e.g., prolonged sitting, repetitive tasks, computer work).
- Voluntary participation with informed consent.

Data Collection Methods

- **Structured Questionnaires:** Captured information on ergonomic awareness, workstation setup, prevalence of discomfort, and perceptions of productivity impact. Questions included Likert scale items, multiple-choice responses, and symptom checklists

- **Semi-Structured Interviews:** Explored personal experiences, perceptions of workplace ergonomics, and suggestions for improvement.
- **Direct Observations:** Recorded posture, workstation arrangement, lighting, and break patterns, using an OSHA-based checklist.
- **Rapid Upper Limb Assessment (RULA):** Administered to 35 participants to quantitatively evaluate postural risks related to upper limbs, neck, trunk, and legs.

Data Analysis

- **Quantitative Data:** Analyzed using descriptive statistics (frequency, percentage distribution) and correlation analysis to explore relationships between ergonomic factors and productivity measures^[23].
- **Qualitative Data:** Interview transcripts and observational notes underwent thematic analysis to identify recurring patterns and concerns.

Ethical Considerations

Participation was voluntary, with confidentiality assured through coded identifiers instead of names. Participants could withdraw at any stage without consequence. Data were stored securely and used exclusively for research purposes.

Results

Demographic Profile of Respondents

The study surveyed 70 employees from the Department of State GST, Karnataka. The majority were in the **36–45 years** age group (34.29%), followed by 46–55 years (24.29%). The smallest representation was from the 18–25 years group (8.57%) (Table 1).

Table 1. Age Distribution of Respondents

Age Group	Count	Percentage (%)
18–25	6	8.57
26–35	15	21.43
36–45	24	34.29
46–55	17	24.29
56 and above	8	11.43

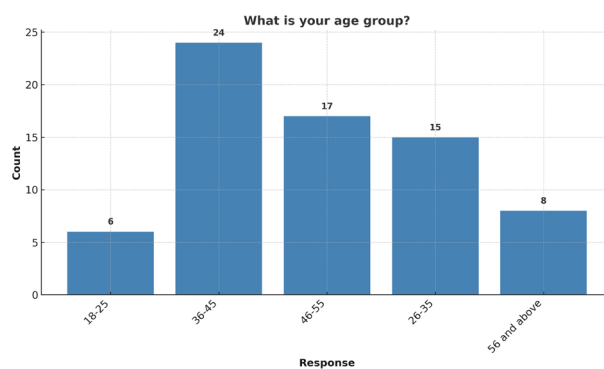


Figure 1: Graphical Representation of Age Distribution of Respondents

The gender split among respondents was nearly equal, with females constituting 51.43% and males 48.57%. This balance suggests that ergonomic findings and perceptions in this study reflect both male and female experiences, ensuring a gender-representative assessment of workplace ergonomics and related health concerns in the organization.

Table 2. Gender Distribution

Gender	Count	Percentage (%)
Female	36	51.43
Male	34	48.57

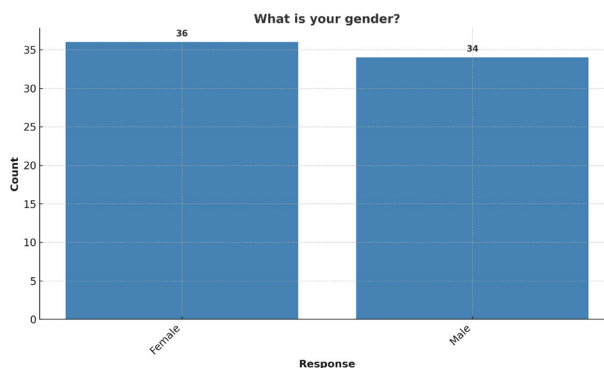


Figure 2: Graphical Representation of Gender Distribution

Job Roles and Work Hours

Officers represented the largest occupational group (35.71%), followed by Data Entry Operators (31.43%). Clerical staff formed 17.14%, Inspectors 11.43%, and Administrative positions 4.29%. This

occupational diversity ensures that ergonomic evaluations account for a variety of work patterns, tasks, and physical demands across different roles in the department.

Table 3. Job Titles of Respondents

Job Title	Count	Percentage (%)
Officer	25	35.71
Data Entry Operator	22	31.43
Clerical Grade	12	17.14
Inspector	8	11.43
Administrative Position	3	4.29

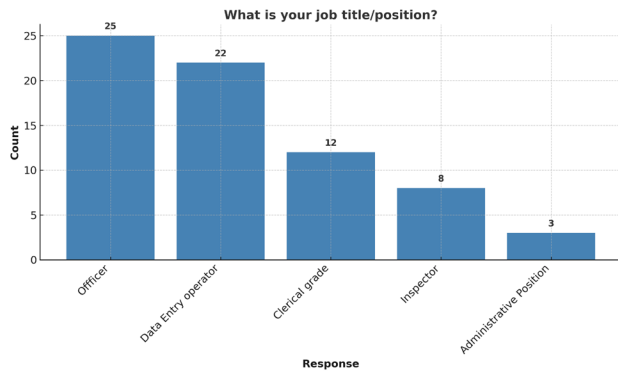


Figure 3: Graphical Representation of Job Titles of Respondents

Most employees (57.14%) worked between 6–8 hours per day, while 24.29% exceeded 8 hours. The remaining 18.57% worked 4–6 hours. Prolonged desk hours, particularly beyond 6 hours, increase susceptibility to ergonomic risks such as musculoskeletal discomfort, making this a critical factor in the study’s risk analysis.

Table 4. Daily Working Hours at Desk/Workstation

Hours per Day	Count	Percentage (%)
4–6 hours	13	18.57
6–8 hours	40	57.14
More than 8 hours	17	24.29

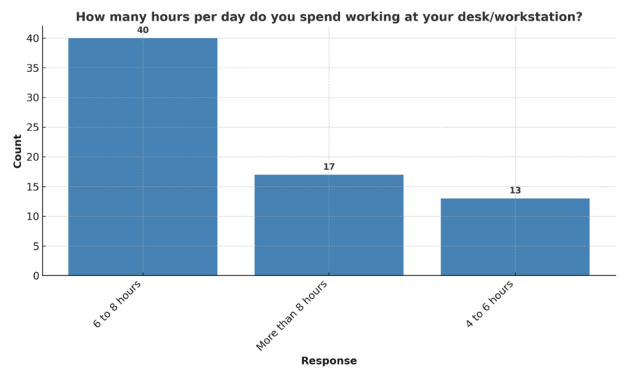


Figure 4: Graphical Representation of Daily Working Hours at Desk/Workstation

Ergonomic Awareness and Availability

A majority (51.43%) were somewhat familiar with ergonomic principles, 28.57% were highly familiar, and 20% had no familiarity. While awareness levels are moderate, the gap between knowledge and application remains evident, highlighting the need for ongoing training and awareness programs to translate ergonomic understanding into daily practice.

Table 5. Familiarity with Ergonomic Principles

Response	Count	Percentage (%)
Yes, very familiar	20	28.57
Somewhat familiar	36	51.43
Not familiar	14	20.00

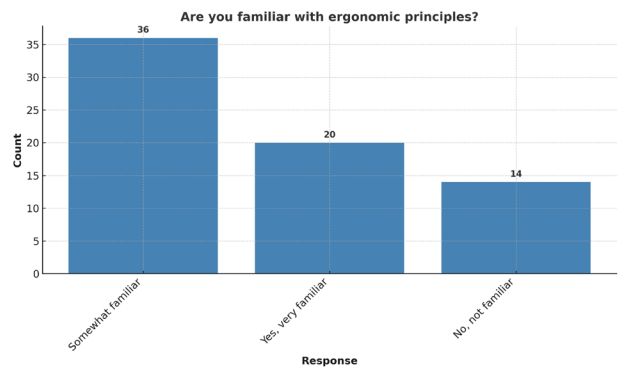


Figure 5: Graphical Representation of Familiarity with Ergonomic Principles

Partial availability was reported by 70% of employees, while only 18.57% had fully ergonomic workstations. Ten percent lacked ergonomic furniture entirely. This shortfall indicates that while awareness may exist, infrastructure limitations remain a significant barrier to effective ergonomic implementation in the workplace.

Table 6. Availability of Ergonomic Furniture

Response	Count	Percentage (%)
Somewhat, but improvements needed	49	70.00
Yes, fully equipped	13	18.57
No, not at all	7	10.00
No response	1	1.43

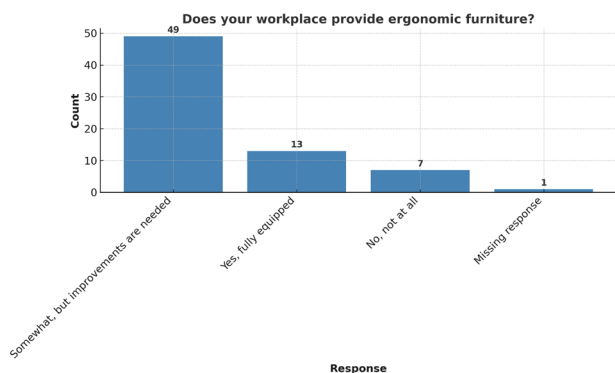


Figure 6: Graphical Representation of Availability of Ergonomic Furniture

Discomfort and Health Issues

Half of the employees (50%) reported mild discomfort, 21.43% experienced moderate discomfort, and 4.29% severe discomfort. Conversely, 22.86% reported no discomfort. The prevalence of discomfort underscores the potential link between inadequate ergonomic setups and physical strain in this administrative work environment.

Table 7. Level of Discomfort Experienced

Response	Count	Percentage (%)
Mild discomfort	35	50.00
No discomfort	16	22.86
Moderate discomfort	15	21.43
Severe discomfort	3	4.29
No response	1	1.43

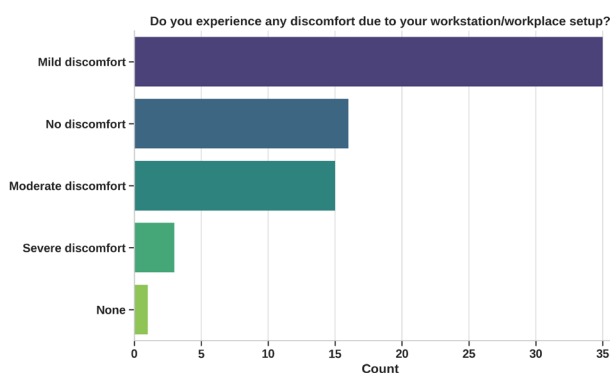


Figure 7: Graphical Representation of Level of Discomfort Experienced

Back pain was the most reported issue (40%), followed by neck pain (21.43%) and eye strain (18.57%). Other symptoms included wrist/hand pain (5.71%), leg pain (1.43%), and miscellaneous issues (4.29%). Only 8.57% reported no discomfort, reinforcing the widespread impact of ergonomic shortcomings.

Table 8. Type of Discomfort Experienced

Discomfort Type	Count	Percentage (%)
Back pain	28	40.00
Neck pain	15	21.43
Eye strain	13	18.57
Wrist/hand pain	4	5.71
Other	3	4.29
Leg pain	1	1.43
None	6	8.57

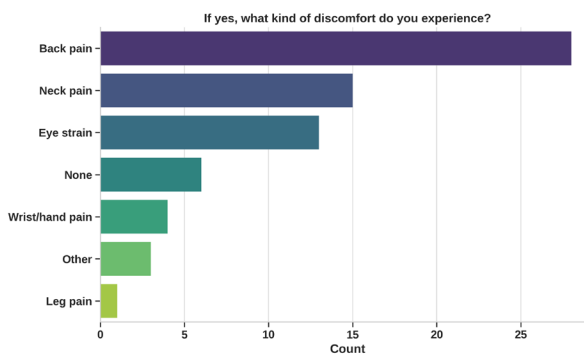


Figure 8: Graphical Representation of Type of Discomfort Experienced

Work Practices and Breaks

Break-taking habits varied: 28.57% took breaks every hour, 30% every 2-3 hours, and another 30% rarely took breaks. Only 10% took breaks every 30 minutes. These infrequent pauses from desk work may contribute to cumulative fatigue and musculoskeletal strain among employees.

Table 9. Frequency of Breaks Taken

Frequency	Count	Percentage (%)
Every 30 minutes	7	10.00
Every hour	20	28.57
Every 2-3 hours	21	30.00
Rarely	21	30.00
No response	1	1.43

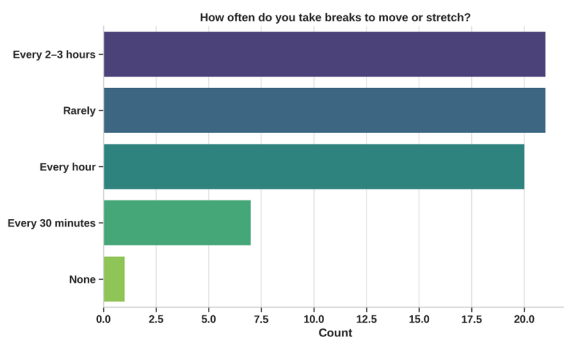


Figure 9: Graphical Representation of Frequency of Breaks Taken

Perceptions of Ergonomic Impact

Over half (57.14%) believed improved ergonomics would significantly reduce health issues, 21.43% thought it would help somewhat, and 12.86% were unsure. Only 5.71% felt ergonomics would make no difference, indicating a strong employee belief in its potential health benefits.

Table 11. Belief that Ergonomics Reduces Health Issues

Response	Count	Percentage (%)
Yes, significantly	40	57.14
Yes, somewhat	15	21.43
Not sure	9	12.86
No difference	4	5.71
No response	2	2.86

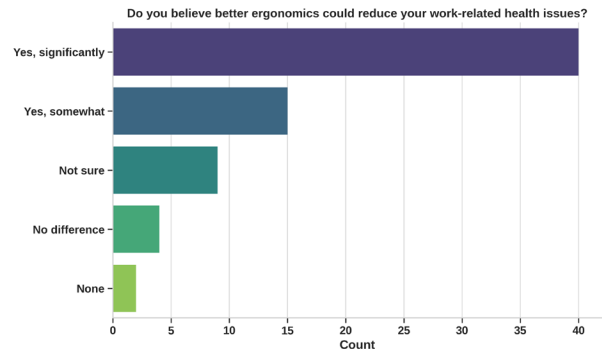


Figure 11: Graphical Representation of Belief that Ergonomics Reduces Health Issues

RULA Analysis

The RULA assessment revealed positive aspects such as appropriate viewing distance (57.8 cm) and display angle (12.5°). However, the absence of lumbar support, footrests, task lamps, and non-adjustable chair heights contributed to medium-to-high ergonomic risk scores, indicating the need for immediate workplace interventions.

Table 12. RULA Analysis

Variable	Representative Value
Viewing Distance (cm)	57.8 cm
Display Angle (°)	12.5°
Display Height	Eye Level
Task Lamp	No
Document Stand	No
Keyboard Slope (°)	9.1°
Mouse Placement	Higher
Table Height Adjustable	Yes
Seat Pan Tilt	No
Foot Rest	No
Sliding Seat Pan Adjustment	Yes
Chair Height Adjustment	No
Lumbar Support	No
Adjustable Arm Rest	Yes
Chair Base Type	5 Point

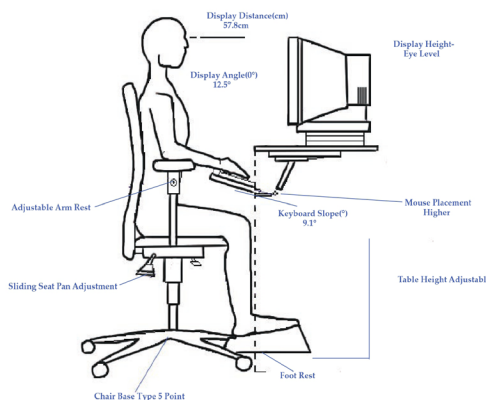


Figure 12: RULA Analysis

Discussion

The findings of this study reinforce the significant relationship between workplace ergonomics, employee comfort, and productivity. While a majority of respondents demonstrated moderate to high awareness of ergonomic principles, practical implementation was inconsistent. The prevalence of discomfort particularly back and neck pain highlights the gap between awareness and actual ergonomic compliance^[28].

The RULA analysis further substantiates this concern, identifying medium to high ergonomic risks. Although certain workstation elements, such as screen positioning and adjustable table height, met ergonomic standards, critical deficiencies were evident^{[29][30]}. The absence of lumbar support, non-adjustable chair height, lack of a footrest, and poor input device placement directly contribute to musculoskeletal strain. These shortcomings, coupled with infrequent breaks, create conditions conducive to chronic discomfort and reduced work efficiency.

Perceptual data align with these objective assessments, as over 62% of employees believed that improved ergonomics would significantly enhance efficiency, and 57.14% expected reductions in health issues. However, the high proportion of employees who had not reported their concerns suggests organizational and cultural barriers to ergonomic improvement^[31].

Overall, the results validate the study's hypotheses that poor ergonomics adversely affect both health and productivity, and that targeted interventions could yield substantial workplace benefits.

Conclusion and Recommendations

This study examined the impact of workplace ergonomics on productivity, comfort, and health among employees in the Department of State GST, Karnataka, through a mixed-methods approach combining surveys, observations, and RULA assessments. The results indicate that while ergonomic awareness among employees is moderate to high, its practical application remains insufficient. Prevalent issues such as back pain, neck pain, and eye strain were strongly associated with poor workstation setups, infrequent breaks, and inadequate ergonomic infrastructure.

The findings related to inadequate ergonomic infrastructure have significant implications for **physiotherapy and occupational therapy professionals**. These professionals play a crucial role in:

- **Identifying and managing work-related musculoskeletal disorders (WMSDs)** caused by poor ergonomic conditions.
- Providing **individualized interventions** such as posture correction, exercise programs, and ergonomic education.
- Collaborating with employers to **assess workstations** and recommend modifications tailored to the physical needs of employees.
- Promoting preventive strategies through **ergonomic awareness workshops** and **early screening** of discomfort-related symptoms.

Their involvement can help reduce long-term health complications, decrease absenteeism, and improve workplace productivity and employee well-being.

Limitations of the Study

1. Pilot Study Scope:

As a preliminary pilot study, the sample size was limited, and findings may not be generalizable across other departments or regions.

2. Self-reported Data:

Data was collected through questionnaires, which may be subject to self-reporting bias, such as underreporting or exaggeration of discomfort levels.

3. Lack of Objective Measurements:

The study did not include physical assessments or observational ergonomic evaluations, which could have provided more comprehensive insights.

4. Demographic Associations Not Explored:

Potential associations between discomfort and demographic factors were not statistically analyzed in this phase.

The RULA analysis confirmed medium to high ergonomic risk levels, particularly due to the absence of lumbar support, inappropriate input device placement, and non-adjustable seating. These deficiencies hinder optimal posture, increase musculoskeletal strain, and negatively affect efficiency. Employees' perceptions further reinforce the need for ergonomic interventions, with a majority recognizing the potential benefits for both productivity and health.

Recommendations

- **Provision of Ergonomic Furniture:** Supply adjustable chairs with lumbar support, height-adjustable desks, monitor stands, and footrests.
- **Workstation Redesign:** Ensure optimal positioning of monitors, keyboards, and pointing devices to reduce strain.
- **Break and Movement Policies:** Implement microbreak schedules to reduce prolonged static postures.
- **Training and Awareness Programs:** Conduct regular ergonomic workshops and posture training sessions.
- **Periodic Ergonomic Assessments:** Utilize tools like RULA for routine risk evaluation and corrective action.

Implementing these measures can foster a healthier, more productive workforce while reducing the long-term risk of musculoskeletal disorders.

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Conflict of Interest: The authors declare that there is no conflict of interest regarding the publication of this paper.

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