Ergonomic study of gari frying population in south western Nigeria

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INTRODUCTION

1

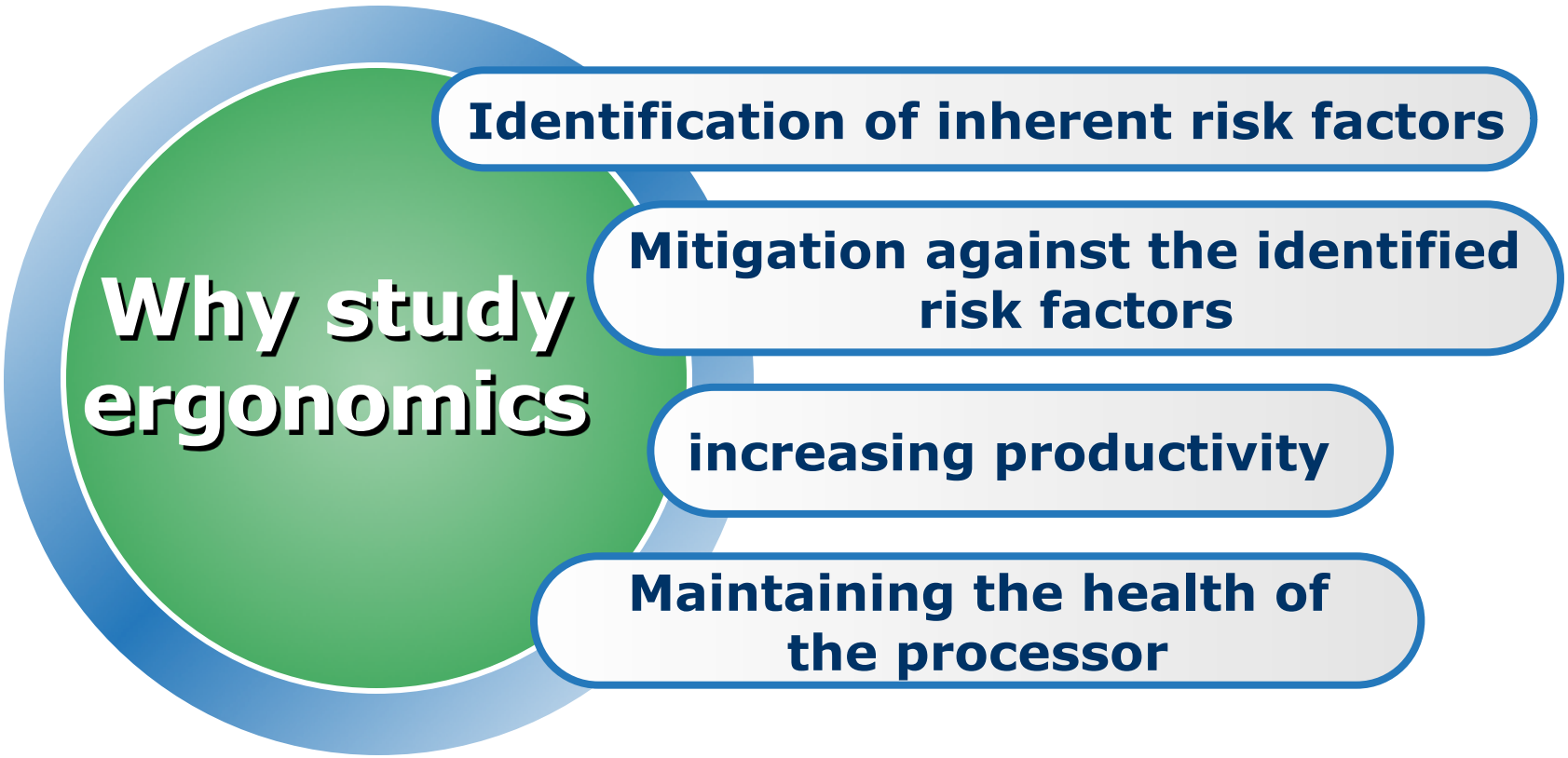
Gari frying is highly labour-intensive in this part of the world due to the crudeness of the methods used, as it is carried out at an artisan level

2

The inherent problems of this process has to do with reduced level of performance due to non-conducive atmosphere and its attendant low productivity; also, the discomfort, due to heat and the sitting posture of the operator

3

Ergonomics is the area of knowledge dealing with the capabilities and limitations of human performance in relation to the design of machines, job and other modifications of the environment


Why study ergonomics
Identification of inherent risk factors
Mitigation against the identified risk factors
increasing productivity
Maintaining the health of the processor

INTRODUCTION

Engineering measures (i.e. redesigning the process or equipment)

Substitution measures (e.g. changing equipment or tools)

Administrative measures, such as revising work procedures, i.e., changing the sequence of steps or adding steps

INTRODUCTION CONT.

- Anthropometry is the scientific measurement and collection of data about human physical characteristics and application of these data in the design and evaluation of systems, equipment, manufactured products, human-made environments, and facilities

Little or no anthropometric data is available for *gari*-frying population

failure to take into account human physical characteristics when designing systems or equipment place unnecessary demands and restrictions upon personnel

OBJECTIVES

1

To study the posture adopted in gari-frying in Southwest and effect on yield

2

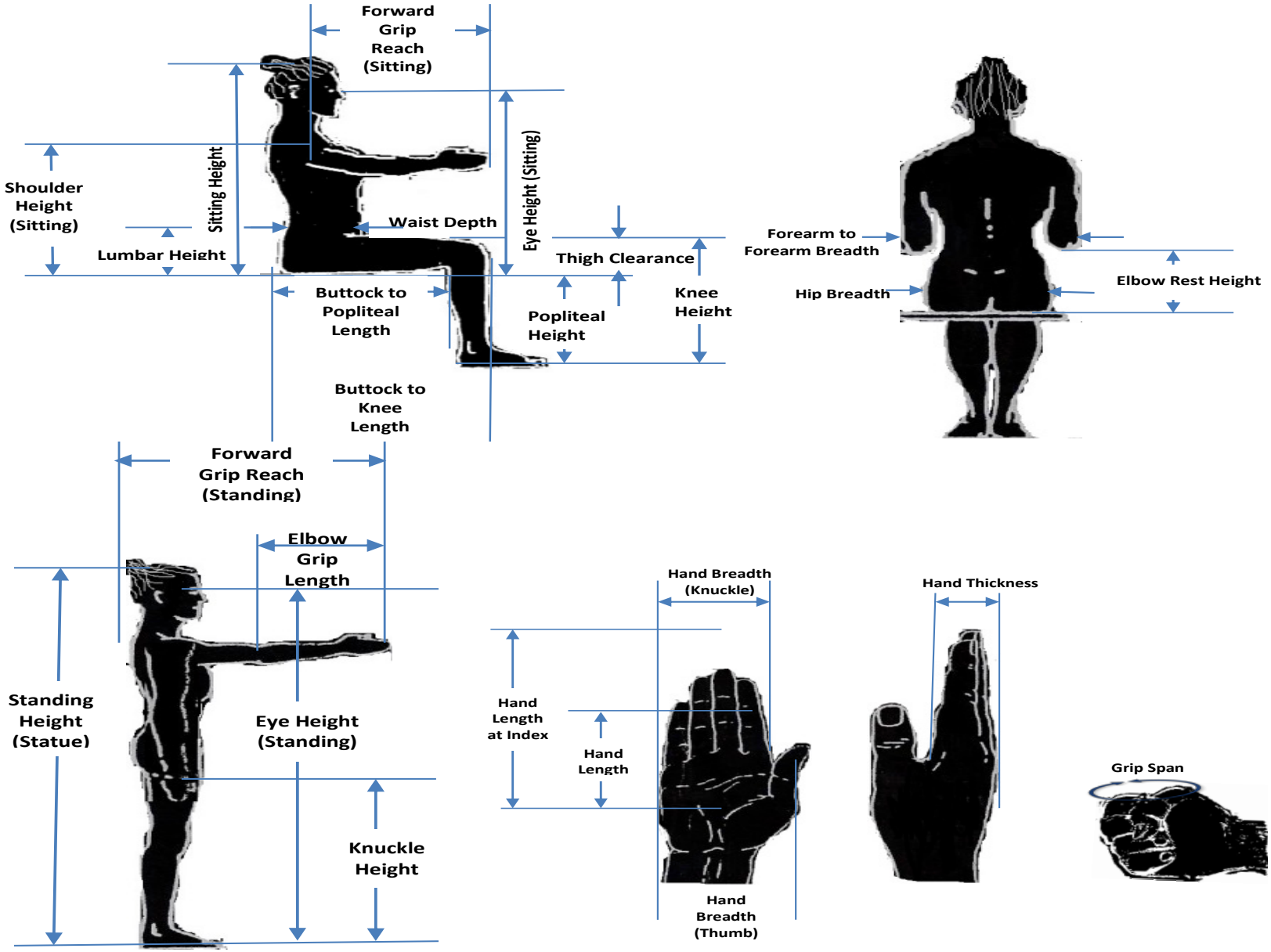
To generate anthropometry data for southwestern gari frying population and designing to fit gari-frying facilities

METHODOLOGY

- Twenty processors were surveyed in each Southwestern state of Nigeria, totaling 120 subjects. Information were collected through questionnaires, oral interview, personal observation and direct anthropometry data measurement

Methodology

The body dimensions include stature, shoulder height, sitting height, eye height, forward grip reach, buttock-popliteal height, buttock-knee length, knee height, thigh clearance, forearm-to-forearm breadth, waist depth, elbow rest height, knuckle height, elbow grip length, hip breadth, hand length, hand breadth, hand thickness, grip span and lumbar height


Forward Grip Reach (Sitting)
Shoulder Height (Sitting)
Sitting Height
Lumbar Height
Waist Depth
Eye Height (Sitting)
Thigh Clearance
Buttock to Popliteal Length
Popliteal Height
Knee Height
Buttock to Knee Length
Forward Grip Reach (Standing)
Elbow Grip Length
Standing Height (Statue)
Eye Height (Standing)
Knuckle Height
Forearm to Forearm Breadth
Hip Breadth
Elbow Rest Height
Hand Breadth (Knuckle)
Hand Length at Index
Hand Length
Hand Breadth (Thumb)
Hand Thickness
Grip Span

METHODOLOGY

- Processor characteristics: number of persons at a frying point, number of hands in use and posture at fireplace, position of other working tools
- Workplace characteristics: Parameters relating to the effectiveness of frying pan with respect to shape, size and number of frying containers as well as smoke control mechanism

METHODOLOGY

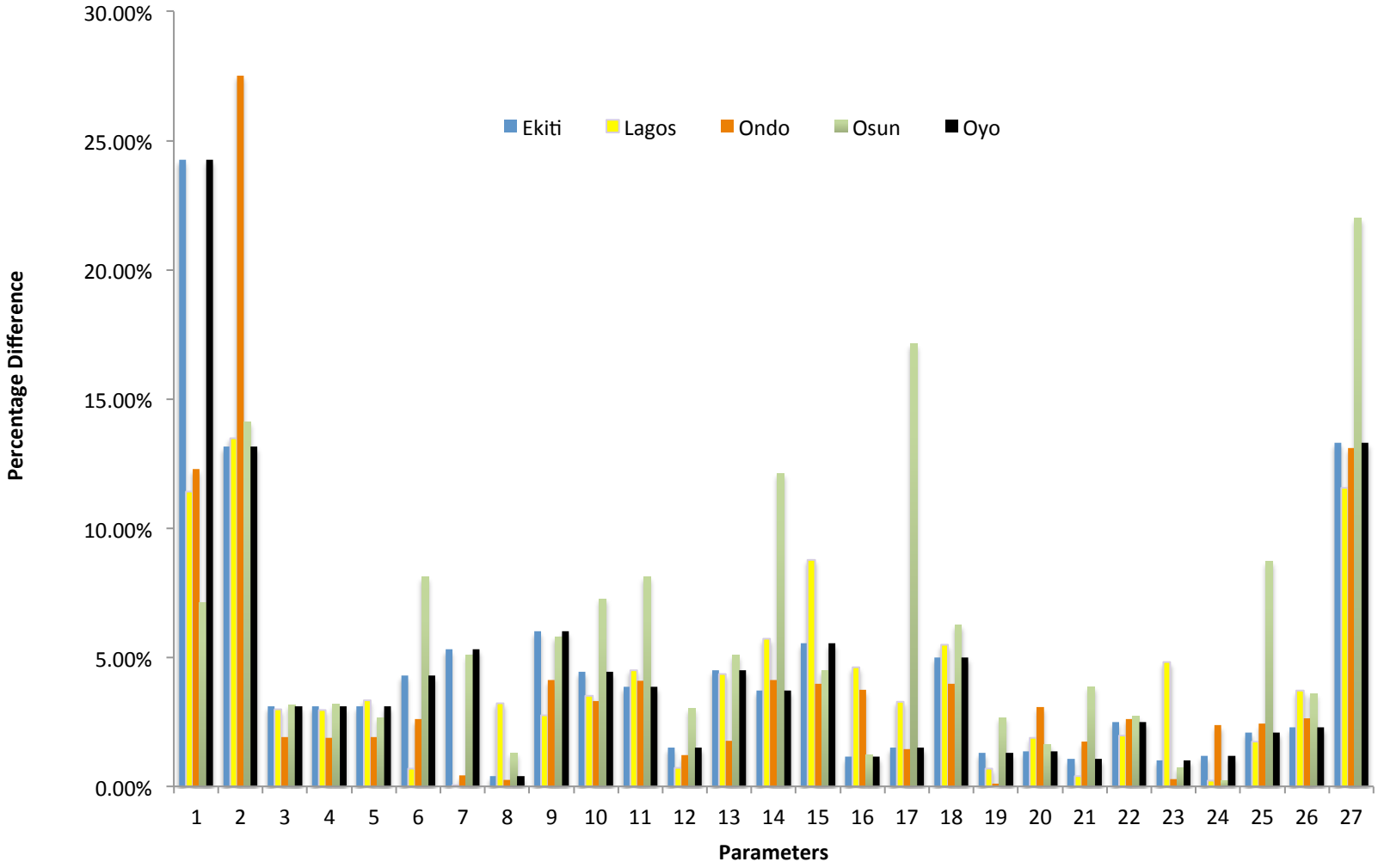
- socio economic characteristics: includes ownership of business venture, willingness to transfer business to their children and ward, profitability of the business

METHODOLOGY

- SPSS software was used to determine the 2^{nd}, 5th, 10^{th}, 50^{th}, 75^{th}, and 95^{th} and 98^{th} percentiles and performed analysis of variance using SPSS software package at 5% level of significance for each state under investigation

RESULTS AND DISCUSSION

- Comparative analysis Figure 2 shows the extent of variation of each measured parameter between each state of Ekiti, Lagos, Ondo, Osun and Oyo against Ogun (reference state).



Key: 1-Age; 2-Weight; 3-Height; 4-Shoulder Height (sitting); 5-Eye height (standing); 6-Eye height (sitting); 7-Forward grip reach (standing); 8-Forward grip reach (sitting); 9-Sitting height; 10-Buttock-popliteal length; 11-Buttock-to-knee length; 12-Popliteal height (sitting); 13-Knee height (sitting); 14-Thigh clearance; 15-Forearm-to forearm breadth; 16-Waist depth; 17-Elbow rest height sitting; 18-Knuckle height; 19-Elbow grip length; 20-Hip breadth (sitting); 21-Hand length; 22-Hand breadth at thumb; 23-Hand breadth at knuckles; 24-Hand thickness; 25-Grip span; 26-Hand length @ index; 27-Lumbar height.

Figure 2: Variation between Anthropometric Data of Different States in Southwestern Nigeria.

- The result showed that for all the states, there was a notable variation of around 11.42% – 24.25% in the mean age, weight and lumbar height except for Osun state with 7.11% difference, compared to Ogun state.
- The mean values for forward grip reach (standing), sitting height, forearm-to-forearm, breadth and knuckle height for most of the five states were 5% – 6%, different from that of Ogun state. Six anthropometric parameters from Lagos state were less than 1%, different from that of Ogun state while for Osun state; eight parameters were between 7% and 22%.

WITHIN STATE

- High deviation was observed for the age, weight, height and eye height (standing), but other anthropometric parameters had lower standard deviations ranging in all the states .

WITHIN STATE

- This shows that a workplace designed based on anthropometric data from another population (even in the same location) will not be ergonomically suitable for the target population.
- Anthropometry data for other population does not tally with gari frying population

Table 1: Showing variations in the ergonomic characteristics of improved traditional *garification* method in southwestern Nigeria

features	Processors characteristics			Workplace characteristics	Heating process		Estimated output kg/8hr
type	No of operators	No of hands used	posture	In/outdoor	Frying medium (shape/ size)	Smoke control mechanism	
1	1	single	SB	Outdoor	circular	chimney	40
2							60
3					Trapezoid (Med)	Not provided	145
4	2				Trapezoid (large)	Low wall shield	250
5	1		SIF	Indoor	Trapezoid (Med)	Chimney and enclosed	135
6				Outdoor		Not provided	150
7		both	standing		Trapezoid (Large)		220
8			ABSS				230

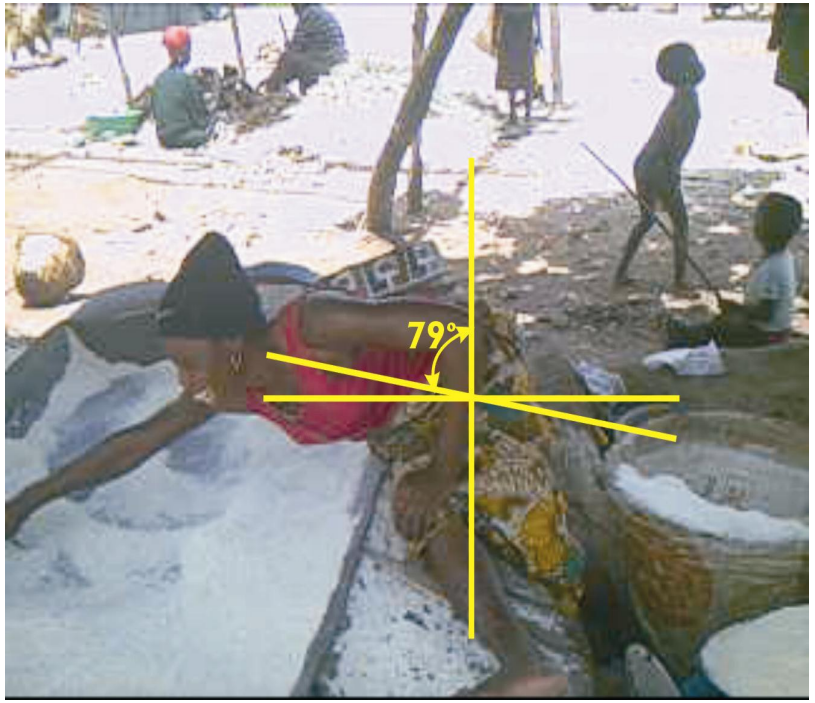
Posture pictures

SB

Abss

Standing

SIF



Result and Discussion cont.

1. **Majority of processors are hired hands**
2. ABSS is the best posture from this study as it complies with Gibbs (2004)
3. **Most of the processing centres have off-takers for their produce**
4. **40% sell the processed gari in local markets**
5. **Viewed as not being lucrative**
6. **Unwilling to have their children take over**

Result and Discussion cont.

1. Poor output , poor overall returns and unhygienic product
2. Uncomfortable working conditions due to heat and working posture
3. Low moral and lack of zeal
4. Overexertion of the body
5. Work related musculoskeletal disorders

CONCLUSION

- Anthropometry data varies within and across population and should be taken for target audience to get best fit, hence; Percentiles representative of best fit should be used in designs for Gari frying pans.
- Designing without ergonomic considerations adversely affect the health, moral and income of the rural working population
- Ergonomic considerations in design promote rural entrepreneurship and wealth creation

Take home

The rewards for careful attention to ergonomics include a more efficient production process, lower labor costs, increased injury absences, increased turnover and reduced expenditures for medical care

Acknowledgement

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Thank You