BALTIC JOURNAL OF LAW & POLITICS
A Journal of Vytautas Magnus University
VOLUME 16, NUMBER 2, (2023)
ISSN 2029-0454

Cit.: *Baltic Journal of Law & Politics* 16:2 (2023):510-521
DOI: 10.2478/bjlp-2023-0000038

Workplace Safety Ergonomics And Employee Productivity Of Manufacturing Firms

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Abstract
This study determined the effect of workplace safety ergonomics on employee productivity in manufacturing firms in Kenya. The study was grounded on the domino theory. The study adopted a cross-sectional survey research design, guided by positivist research philosophy. The target population was 853 manufacturing firms that were registered with the Kenya Association of Manufacturers (KAM). A sample of 124 firms distributed across the fourteen sub-sectors in the manufacturing sector was obtained. The target respondents were 124 heads of human resources in each sampled firm. Data was collected using structured questionnaires. Regressions analysis was used. The results established that workplace safety ergonomics in the form of hazard detectors, protective devices and effects analysis have a statistically significant influence on the productivity of employees in manufacturing firms. The findings offer insight into the significance of safety ergonomics on employees' value added, degree of accomplishment of tasks and productive time.

Keywords: Workplace safety ergonomics, employee productivity, manufacturing firms, COVID-19, accomplishment of tasks, exposure analysis, protective devices.

INTRODUCTION

1.1 Background of the Study

Organizations rely on employees to function and meet the set objectives. Organizations use a lot of resources to sustain and maintain a productive workforce. Safety challenges may inhibit employee productivity (European employee productivity council report, 2019). Globalization and technological revolution have major implication on human resource management; changing nature of work, changing workforce and workplaces, safety concerns, consequently greater expectation of the workforce from the changes. The human resource practitioner now deals with a more complex and safety prone workplace (Byarset, 2014). These changes could be affecting the productivity of the employees. Further, organizations face new regulation in the areas of safety and quality of work life. It has become more apparent that programmes for occupational safety may not be protecting workers effectively from workplace job hazards and this may be affecting productivity of the employees (Gupta, 2016).

Employees require a state of optimal safety to be able to be optimally productive; therefore organizations require appropriate programmes to cover all possible contingencies without

interruption of normal work operations. Workplace safety ergonomics improves workplace safety through the detection and elimination of hazards. Hulme et al. (2022) posit that workplace safety ergonomics reduces the risk factors that lead to injuries, ensuring employees' optimal productivity is not interfered with. Capodaglio's (2022) study adds that workplace safety ergonomics are expected to improve work activity comfort and reduce safety injuries and fatigue; ensuring employees accomplish their work tasks fully. Inadequate workplace safety ergonomics exposes employees to injury, rapid fatigue, and productivity loss (Ravindran, 2021).

Despite previous research consistently identifying workplace safety ergonomics as a strategy to boost work safety and employee productivity, they have been faulted in four areas; firstly, the studies have not evaluated the three indicators of workplace safety ergonomics (hazard detectors, protective devices, and effects analysis) against employee productivity. For instance, Leber et al. (2018) investigated the impact of protective ergonomics on work efficiency for persons with disability; Ravindran (2021) investigated the impact of hazard ergonomics on work performance while Sinno et al. (2020) and Pickson et al. (2017) focused on recognition of symptoms of overexposure and employee wellness. Second, the methodological rigor applied by previous studies did not conclusively establish the link between safety ergonomics and employee productivity; Chintada (2022) and Bayram (2022) did a critical literature review and therefore failed to generate original findings, while Leber et al. (2018) analyzed data using frequencies and percentages. Third, previous literature is anchored on different industries, firms, and countries; therefore, have a minimal application to manufacturing firms in Kenya. Fourth, previous studies have not related workplace safety ergonomics with employee productivity measured by productive time, degree of accomplishment of tasks, and value-added. The current study filled these research gaps.

1.3 Objective of the Study
To evaluate the effect of workplace safety ergonomics on employee productivity in manufacturing firms in Kenya.

1.4 Hypothesis of the Study
H_{01}: Workplace safety ergonomics has no effect on employee productivity in manufacturing firms in Kenya.

2. Literature Review
2.1 Theoretical Review
This study was grounded on the domino theory. The theory explains the rationale for workplace safety and its influence on employee productivity.

2.1.1 The Domino Theory
This theory was developed by Heinrich (1931). Domino theory posits that incidents result from a chain of sequential events, metaphorically like a line of dominoes falling over. When one of the dominoes falls, it triggers the next one. The theory posits that removing a key factor (such as an unsafe condition or an unsafe act) prevents the start of the chain reaction. According to Domino theory, all incidents are directly related to a lack of safety ergonomics. The theory posits that two combining factors lead to unsafe workplaces; faults of the person (personal and ancestry) and the environment or work-related factors. The person's faults are due to inherited or acquired faults such as recklessness, violent temper, nervousness, excitability, inconsiderateness, and ignorance of safe practices and constitute proximate reasons for committing unsafe acts. Work-related factors include work overload, wear and tear, low-quality equipment, and bad design or maintenance. These causes of accidents can be eliminated using a safety management system. When employees are safe, they are likely to produce better in the organization (Michael & Merson, 2016). This theory was relevant to this study because protective factors (safety ergonomics) reduce the effects of exposure to diversity. The more protective factors are available, the more resilient institutions are to risk, and the more the employees are likely to perform productively without worrying about safety issues. Decreases in workplace incidents often lead to a transformed culture that leads to higher productivity and employee satisfaction (Aswathappa, 2015). Reese (2018) critiques the domino theory for only focusing on

the causes and ways to minimize workplace incidents. It does not indicate the employee productivity gains derived from a safe workplace.

2.2 Empirical Literature

Safety ergonomics is designing an environment of employee safety through detecting and eliminating safety hazards. De Cieri & Lazarova (2021) posits that an effective workplace safety management system is the most cost-effective approach to dealing with safety risk because responding becomes very costly because of employee productivity costs. Safety Ergonomics involves designing the workplace, tools, and devices for safety (Armstrong, 2020). It aims to eliminate the risk of injury due to work to optimize employee productivity (International Ergonomics Association Executive Council, 2019). International Safety Rating System (2016) posits that safety ergonomics should address areas of hazard detection, protective devices, and effects analysis. Elbert et al. (2018) posit that safety ergonomics deter workplace safety incidents that may cause work disruptions and other productivity losses. Kimwomi (2015) reveals that safety ergonomics such as shutoff controls, industrial robots, temperature, light, and sound controls have become common in manufacturing companies. Christy & Duraisamy (2020) opines that safety ergonomics should involve design considerations, operational features, control systems, visibility, failure modes, and materials handling equipment must-have safety features. Albolino *et al*. (2020) posit that institutions are using industrial robotics to ensure the accomplishment of tasks without disruptions and to caution employees from dangers of exposure.

Despite previous studies suggesting that safety ergonomics would address employee productivity issues in organizations, theoretical models and frameworks in safety literature do not adequately address this assertion. Kingsley (2012) analyzed the impact of office ergonomics on the performance of employees of the Ghana Petroleum Corporation. The study revealed that employees were dissatisfied with the office designs, finishes, and furnishing. This study failed to specify what aspects of safety ergonomics the employees were dissatisfied with and failed to link this to employee performance. Further, the study did not show how employee performance was measured. Young (2014) researched the management of safety in Kenyan institutions. The study lacked specific objectives, and its findings did not indicate which variables were being tested. The study recommended that a study be done on safety ergonomics and their effect on employee performance. Pickson, Bannerman, and Ahwireng (2017) studied the effect of ergonomics on employee productivity in Pioneer Food Cannery in Ghana. The study focused on employees' attitudes on ergonomic risks but failed to study safety programs and productivity effects. Further, the study failed to show how employee productivity was measured but recommended a study on the impact of ergonomic training on employee productivity**.** Olabode, Adesanya and Bakare (2017) examined the effects of ergonomics awareness on employee performance in Nigerian organizations. This study reviewed the literature on comfort ergonomics but none on safety ergonomics. The study indicated that employees could not be productive when physically uncomfortable. The study did not analyze any primary data and hence did not generate original findings on the topic. The current study aimed to provide a good perspective on how safety ergonomics affected employees' productivity using original data from manufacturing firms and combining three superior employee productivity measures.

The study also reviewed the literature on the measurements of employee productivity. The study found that while extant literature has explored measures of employee productivity and the fundamental factors that influence employee productivity, empirical evidence on how workplace safety ergonomics affects employee productivity outcomes is limited. This study adopted three employee productivity measures: first, the degree of accomplishment of tasks. This was proposed by the European employee productivity institute report (2019) and adopted by Laffont and Martimort (2009) and Drucker (2002). The current study assessed the accomplishment of tasks through the number of employees who met their set performance targets per employee performance contracts. Extant literature has pointed out that workplace safety ergonomics may influence employee accomplishment of tasks, but this assertion is yet to be empirically tested. For instance, a study by Karaboga et al. (2022) and Obong *et al.* (2021) opined that workplace safety ergonomics leads to work efficiency, behavioral changes, and accelerated employee adaptation of tasks which may affect the degree to which employees perform routine tasks.

The second employee productivity measure adopted was value added. Drucker (2002) posits that value added by employees is computed by dividing total revenues by the number of employees in the firm. A study by Hacamo (2022) posited that safety ergonomics may prevent the onset of lost workday cases, liability costs, and other costs that may reduce employee value added. The third employee productivity measure adopted by the study was productive time. European employee productivity institute report (2019) and Hacamo (2022) stated that worker productivity is measured by comparing the actual hours worked by an employee and the standard work hours during a period. This study evaluated employee productivity by considering lost work time due to safety incidents. Data from the Bureau of Labor Statistics report (2019) has reported that the manufacturing sector reports more lost workday cases than other sectors. The report showed that of the 5.7 million injuries reported in workplaces worldwide, about half were in manufacturing firms.

2.3 Conceptual Framework

The conceptual framework represents diagrammatically and explains the relationship among variables in the situation being examined.

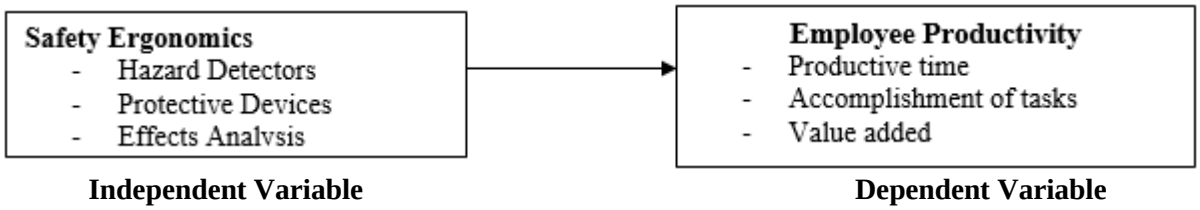

Figure 1: Conceptual Framework
Source: Author Generated

From the empirical and theoretical literature reviewed, the variables were operationalized as follows;

Variable	Type of the Variable	Indicators	Measurement
	Independent		Percentage rate
Workplace safety ergonomics	Independent	**Hazard Detectors:** Safety audits /workplace analysis, hazard & accident reporting, intelligence services, heat detectors, combustion gas and smoke detectors, **Protective Devices:**, sound, illumination , noise vibration absorption, robotics and CCTV cameras, screening and background checks , unauthorized entry, fire control and security alarms, safety warnings, safe working tools and workplaces, facility planning and design, sanitary conveniences: changing rooms, portable water **Effects Analysis:** Recognition of Symptoms of over exposure	Percentage rate
Employee productivity	Dependent	- Productive time	Period in days
		- Accomplishment of tasks	Tasks accomplished out of the standard tasks
		- Value added	Total firm revenues / Number of employees in a firm

Table 1: Operationalization of Variables
Source: Author Generated

3. RESEARCH METHODOLOGY

3.1 Research Philosophy and Design

This study adopted a positivist research paradigm and a cross sectional survey design. Data was collected using structured questionaires.

3.2 Theoretical Framework

The study adopted the theory of production advanced by Cobb and Douglas (1928) to examine the relationship between employee safety and employee productivity. Employee productivity in manufacturing firms was regarded as the output achieved through combination of inputs or independent variables which were employee safety as the independent,

The model developed by Cobb and Douglas (1928) who empirically tested the theory established the production function indicated in Equation 1.

$$Y(L, K) = bL^{\alpha}K^{\beta} \quad \ldots\ldots\ldots\ldots 1$$

Where: Y is total production, L is labor input, K is capital input, b is total factor productivity α and β are the output elasticities of labor and capital respectively.

The prediction level of the general model for predicting employee productivity was therefore specified as shown in equation 2

$$Y = \beta_0 + \beta_1 X_1 + e_4 \quad \ldots\ldots\ldots\ldots 2$$

Where: y is employee productivity, β_0 is regression constant, $\beta_1, \ldots, B_4$ are Coefficients, x_1 was safety ergonomics and ε is error term.

3.3 Target Population

The target population was the 853 manufacturing firms in Kenya registered with the Kenya Association of Manufacturers (KAM) and have been operating for the last three years. Data collection and analysis was done at the firm level, with target respondents being the heads of human resource. The firms were classified into 14 key sectors of manufacturing based on the products they manufacture.

3.6 Sampling Procedure and Sample Size

Out of a population of 853 manufacturing firms in Kenya, a representative sample of 124 was obtained using a statistical formula suggested by Nasiuma (2010), as shown in equation 3

$$\text{Sample size} = \frac{\text{Population of manufacturing firms} * 17\%^{2}}{17\%^{2} + (\text{Population of manufacturing firms} - 1)0.05^{2}} \quad \ldots\ldots\ldots\ldots 3$$

Where: The coefficient of variation was fixed at 17% and standard error was fixed at 5%. The firms were selected randomly. Therefore the target respondents were 124 heads of human resources in each sampled firm.

4. FINDINGS AND DISCUSSION

4.1 Descriptive Analysis of the Study Variables

This section contains descriptive analysis of the study variables summarized by use of mean and standard deviation summary statistics. Respondents were required to respond to a Likert rating scale on the workplace safety ergonomics present. Sixteen parameters were considered. The results obtained are shown in table 2. Where 5 is Strongly agree, 4 is Agree, 3 is Neutral, 2 is Disagree while 1 is Strongly Disagree).

Table 2: Workplace Safety Ergonomics Indicators and Parameters

Workplace Safety Ergonomics	N	Mean	Std. Deviation
My firm has a separate budget for employee safety	108	3.4074	1.07683
My firm does safety audits to determine workplace, procedure and equipment safety	108	1.9537	1.04465
My firm has a hazard reporting programme	108	3.9630	.91637
There is sufficient illumination in our workplace	108	4.2870	.88657
My firm has noise diversion controls to protect employees from the sound energy	108	3.2130	1.24593
My firm has anti vibration equipment	108	2.7037	1.34136
My firm uses robotics to reduce dangers of contact and to ease work procedures	108	2.0463	1.29257
Adequate security cameras are used to monitor work and deter unsafe incidents	108	4.0463	1.24843
There are metal detectors at entry points to reduce security threats on employees	108	3.0833	1.58925
My firm has heat, smoke and combustion gas detectors	108	3.4167	1.53541
There are warning signs at the location of the hazard and other conspicuous locations	108	3.8981	1.26742
My firm has gas, fumes, exhaust regulators	108	3.8519	1.50894
My firm has ventilation and temperature regulators	108	4.0370	1.21460
Personal protective equipment is provided and worn at all time	108	4.2593	1.20257
There is sufficient cleanliness and disinfecting to reduce exposure to incidents	108	4.5278	.71641
My firm designs the job effectively to prevent harmful occurrences.	108	4.3981	.87477
Aggregate Score	108	3.5683	1.18513

Table 2 shows that the workplace safety ergonomics had an aggregate score of (Mean =3.5681, SD= 1.18513). This indicates that, on average, manufacturing firms agreed on various statements on safety ergonomics in place in the manufacturing sector, with variations indicated by the standard deviation value. The standard deviation value was 1.18, showing that respondents varied much in their views on workplace ergonomics in the manufacturing firms in Kenya. According to Pandey (2017), firms who have a majority agreeing to safety ergonomics in the workplace demonstrate their commitment to workplace safety. Therefore, the results obtained by the current study indicate that manufacturing firms have adopted safety ergonomics programmes. This indicated a commitment to alleviating the possible diverse effects of workplace hazards on employee productivity. According to the Bureau of Labour Statistics report (2019), these results are positive because over 50% of reported disabling injuries in workplaces are related to a lack of safety ergonomics. OSHA Africa report (2019) notes that organizations report fewer cases of lost work time, increased employee productivity, decreased claims, and lower employee turnover intentions when safety ergonomics are present. Further, the results align with Azambuja Viana *et al*. (2021) on workplace ergonomics considerations for the COVID-19 pandemic on workplace cleanliness, use of robotics, sufficient ventilation, good ventilation, and good ventilation job designs, and hazard assessment and control. However, most respondents disagreed with their firms conducted used robotics and safety audits to assess safety hazards.

These results are similar to the findings of (Corgi, 2020), who found that Kenya manufacturing plant companies had adopted ergonomic safety programmes. The results contradict the results of Osoro and Kanyajua (2019), who found low adoption of ergonomics in State Corporations. The study focused on a sector that was not manufacturing and only focused on one firm. Further, the results of the current study are contrary to findings by Kingsley (2012) that workplace safety ergonomics in the manufacturing sector were hardly in existence. Kingslay's (2012) contrary results can be explained by the fact that the study is not current, was contextualized in a different country from the current study and focused on one manufacturing company.

4.2 Correlation of Workplace Safety Ergonomics and Employee Productivity

The Pearson's Product Moment technique was used to carry out correlational analysis to determine the relationship between work place safety ergonomics and employee productivity.

Table 3: Workplace Safety Ergonomics and Employee Productivity

Correlations			
		Employee Productivity	Workplace Safety Ergonomics
Employee Productivity	Pearson Correlation	1	.858**
	Sig. (2-tailed)		.000
	N	108	108
**. Correlation is significant at the 0.01 level (2-tailed).			

The results in table 3 show that employee productivity and workplace safety Ergonomics are positively and significantly correlated. Correlation between workplace safety ergonomics and employee productivity was$(r = 0.858, p = 0.00 < 0.01)$. This shows that an increase (improvements) in workplace safety ergonomics would increase employee productivity in manufacturing firms in Kenya. These results collaborate with a study by Rosemberg and Li (2018) on effort-reward imbalance and work productivity among hotel housekeeping employees that identified workplace safety as one of the extrinsic employee rewards critical for work productivity. However, the study was based in a hotel sector in Michigan, which is in a different context from manufacturing firms in Kenya. The study used presenteeism and absenteeism as measures of employee productivity. In contrast, the current study used a combination of three superior employee productivity measurements (productive time, the accomplishment of tasks, and value-added.

Second, the findings of this study can be explained from theoretical literature by the Domino theory by Heinrich (1931), which postulates that the presence of protective factors (safety ergonomics) reduces the effects of exposure to diversity. The more protective factors are available, the more resilient institutions are to risk, and the more the employees are likely to perform productively without worrying about safety issues. This implies that workplace safety

ensures that employees are protected in their workplace, leading to positive returns on employee productivity. Therefore, holding other factors constant, proper workplace safety management can eliminate employee productivity problems.

4.3 Regression Analysis of Work place Safety and Employee Productivity

To test the Null Hypothesis H_{01} which stated that Workplace Safety Ergonomics has no effect on employee productivity in manufacturing firms in Kenya. Regression analysis was carried out.

Table 4 : The Goodness of Fit of Model for Objective One

Model Summary									
				Std. Error of	Change Statistics				
Model	R	R Square	Adjusted R Square	the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.893[a]	.798	.790	.39307	.798	101.421	4	103	.000

a. Predictors: (Constant), Workplace safety ergonomics.

The results in Table 4 showed that the value of the adjusted R-squared obtained for the effect of workplace safety Ergonomics on employee productivity was 0.790 at a probability value of 0.000, which is less than the significance value of 0.05. The R-squared 0.790 obtained implies that holding all other factors constant, the independent variable workplace safety can explain 79.0 % of the variations in employee productivity. In comparison, 21% of variations in employee productivity are explained by random error or other factors. This implies that an increase in workplace safety will lead to increased employee productivity in terms of productive time, the accomplishment of tasks, and value-added.

To further investigate the effect of workplace safety on employee productivity in manufacturing firms in Kenya, Analysis of Variance (ANOVA) was carried out to ascertain the significance of the estimation model. Results presented in table 5.

Table 5: The Overall Significance of the Model for Objective One

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	62.681	4	15.670	101.421	.000[b]
	Residual	15.914	103	.155		
	Total	78.595	107			

a. Dependent Variable: Employee Productivity
b. Predictors: (Constant), Workplace safety ergonomics

The findings presented in Table 5 show the ANOVA results of the regression model estimating the effect of workplace safety on employee productivity. The results show that F (4, 103) =101.421 and p-value=0.000<0.05, implying that the model used is statistically significant. Also, this signifies that the null hypothesis stating that workplace safety has no effect on employee productivity in manufacturing firms in Kenya is rejected. A conclusion is drawn that workplace safety has a statistically significant effect on employee productivity.

Further the study multiple regression results determined the coefficient estimates that pointed out the magnitude of each work place safety measure on employee productivity. The regression coefficients for the model were presented in Table 6.

Table 62: Coefficient Estimates of the Objective One Model

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	14.415	.088		163.16	.000
Workplace safety ergonomics	.579	.247	.274	2.345	.021

a. Dependent Variable: Employee Productivity

The results point out that the coefficient estimate of the constant (β_0) is 14.415 and p-value=0.000<0.05. This depicts that employee productivity increases by 14.415 regardless of being influenced by the work place safety Ergonomics.

Regarding the effect of workplace safety ergonomics on employee productivity, the results obtained a coefficient estimate (β1) =0.579 and p-value=0.021<0.05. This depicted a significant positive relationship between workplace safety ergonomics and employee productivity. This implies that as workplace safety ergonomics improve by 100%, employee productivity increases by 57.9 %, holding all other factors constant. These results explain that proper safety ergonomics ensure that workers are fully protected; hence, they can perform productively without disruptions from safety incidents. Further safety ergonomics ensure that work and workplaces are designed for maximum employee productivity. This finding is similar to Leber *et al*. (2018), who studied the impact of ergonomically designed workplaces on employee productivity. The study found that ergonomics enhanced work efficiency and accelerated employee adaptation of tasks leading to better productivity. However, the study was limited to safety ergonomics for persons with disability and failed to test the empirical relationship between employee safety and productivity. The findings of the current study have addressed this gap. The results are also similar to Ravindran's (2021) study on the impact of safety ergonomics on employees' work performance in a Co-operative Hospital, India. The study was a critical literature review that found that a lack of safety ergonomics leads to increased absenteeism, errors, and sick leaves, which reduces the employee's productivity. This has been empirically tested by the current study's findings, which found that workplace safety ergonomics lead to employee productivity in terms of added value, increased productive time, and an increased degree of accomplishment of tasks.

$$Employee\ Productivity(Y) = 14.415 + 0.579x_1 + \varepsilon \quad \text{.....4}$$

Where X_1 is Safety Ergonomics, and e_4 i**s** error term.

The t-statistics obtained for this model**,** as shown in Table 4.19, was 2.345 for workplace safety ergonomics which was less than the significance value of 0.05. Therefore, the interpretation was that workplace safety has a statistically significant influence on the productivity of employees in manufacturing firms in Kenya. This study, therefore, rejects the null hypothesis H01: Workplace safety has no effect on employee productivity in manufacturing firms in Kenya. The P values obtained do not support the hypothesis that workplace safety has no effect on employee productivity in manufacturing firms in Kenya. Therefore the hypothesis was rejected, implying that workplace safety is a good predictor of employee productivity in manufacturing firms in Kenya.

The findings of this study bring out the importance of workplace safety on employee productivity. From the theoretical literature, the study used the postulates of the Domino theory by Heinrich (1931). The theory explained that removing unsafe conditions in a workplace ergonomics reduces the effects of exposure to diversity; hence employees can perform productively without work disruptions or worrying about safety issues. Therefore, the postulates of the domino theory have been confirmed by the findings of the current study that greater safety leads to more productivity by employees. Second, the results show the importance of manufacturing firms installing safety programmes as per the recommendations by the International Loss Control Institute (ILCI) (2015) and as per the guidelines of the National Occupational Safety Association (NOSA) 5- star rating system (2016) that recommend workplace safety programmes should address areas of safety ergonomics. When these programmes are well implemented, manufacturing workplace safety is enhanced, leading to increased employee productivity.
From the descriptive results of this study, workplace safety ergonomics had an aggregate score of (Mean =3.5681, SD= 1.18513). These descriptive results showed that manufacturing firms in Kenya had slightly more than average adopted workplace safety programmes. Therefore the employee productivity losses in manufacturing firms in Kenya, as established Bureau of Labour Statistics report (2019), could be attributed to the lack of proper workplace safety in the manufacturing sector in Kenya. This finding confirms the OSHA Africa report (2019) that opined

that low worker productivity in manufacturing firms could be attributed to a flawed workplace safety system.

Further, the results are consistent with the tip of the iceberg theory of Kahneman McCllelland (2000), which posits that lack of workplace safety is expensive because of productivity costs; time lost in investigating incidences, replacing skilled workers, lower morale, medical and indemnity payments, lost time to implement corrective action, increased absenteeism, and poor customer relations. Therefore, these results enrich the existing theoretical literature involving workplace safety and employee productivity. Workplace safety through safety ergonomics enhances the productivity of employees through increasing productive time, level of accomplishment of tasks, and value-added. Therefore, these findings show that firms could attain better employee productivity if they adopted better COVID 19 workplace safety programmes. The safety programmes studied by the current study are effective in combating COVID 19, which is one of the most outstanding workplace safety issues facing all firms and industries. Further, the findings of this study are consistent with the postulates of (Michael & Merson (2016) and Aswathappa (2015) that workplace safety leads to a productivity culture by the employees hence leads to more productivity gains by the employees in terms of reduced workplace safety incidents, added value by employees, productive time and degree of accomplishment of tasks.

Lastly, the findings bridge the gaps identified in the literature reviewed; Pickson, Bannerman, and Ahwireng (2017) studied workplace safety in one firm, while the current findings originate from original data from 108 manufacturing firms in Kenya. Olabode, Adesanya, and Bakare's (2017) study was based in Nigeria, which has a different contextual setup from the manufacturing firms in Kenya, and did not collect original findings on the topic. The current study used original findings and measured employee productivity by combining three measures value-added, productive time, and degree of accomplishment of tasks. Bieder *et al*. (2018) critical literature review study failed to generate original findings on the area but found that safety ergonomics may boost employee productivity by addressing attitude to risk (chronic unease) therefore improving employee productivity. The current study has empirically tested this using original data from manufacturing firms.

5. Conclusion and Recommendation

5.1 Conclusion

From the finding that workplace safety ergonomics affected employee productivity in manufacturing firms in Kenya, the study concluded that an increase in workplace safety ergonomics in terms of hazard detectors, protective devices and effects analysis led to increase employee productivity in terms of productive time, accomplishment of tasks and value-added.

5.2 Recommendations

The study recommends that manufacturing firms invest in workplace safety ergonomics since this predicts employee productivity in terms of value-added, degree of accomplishment of tasks, and productive time. Human resource managers and other safety professionals should analyze their situation and facility and develop a policy and plan of action that ensures safety in their workplaces. This will enable employees to accomplish tasks without defects, meet their performance targets, and increase their contributed value and productive time.The current study used a cross-sectional sample to test the hypotheses pertaining to relationships of causality. The study recommends that future studies use alternative methods for empirical measuring and testing. Due to the dynamic nature of workplace risks and employee productivity, future studies must resort to case studies, panel data, time-series, or mixed research methodologies.

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