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**THE INFLUENCE OF INDOOR AIR QUALITY AND PSYCHOSOCIAL FACTORS
TOWARDS SICK BUILDING SYNDROME AMONG MANUFACTURING WORKERS**



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MASTER OF SCIENCE (OCCUPATIONAL SAFETY AND HEALTH MANAGEMENT)

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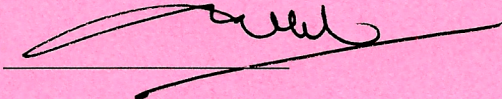
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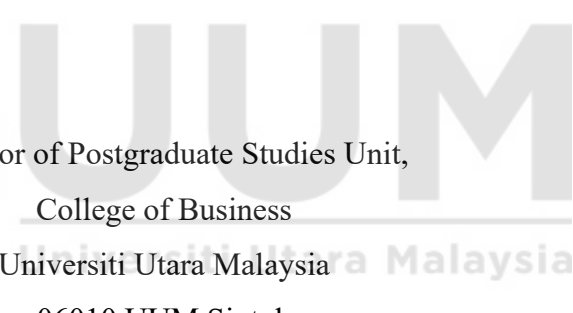
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Abstract

Sick building syndrome (SBS) refers to a collection of health-related symptoms experienced by building occupants, often attributed to poor indoor environmental quality. This phenomenon is influenced by multiple factors, including indoor air quality, noise pollution, and psychosocial elements within the built environment. Poor ventilation, the presence of volatile organic compounds (VOCs), and inadequate air filtration systems contribute significantly to the degradation of indoor air quality, leading to respiratory discomfort, headaches, and fatigue among building occupants. Concurrently, noise pollution, arising from both external and internal sources, exacerbates stress levels, disrupts concentration, and impairs overall well-being. Additionally, psychosocial factors, such as workplace stressors, lack of social support, and environmental stressors, further amplify the negative health effects associated with SBS. The sick building syndrome comprises of various nonspecific symptoms that occur in the occupants of a building. This feeling of ill health increases sickness absenteeism and causes a decrease in productivity of the workers. Therefore, the objective of this study is to investigate the relationship between indoor air quality, noise pollution, psychosocial factors and sick building syndrome among manufacturing workers. The study is conducted at one of the manufacturing companies at Kulim Hi- Tech Park. The sample included 102 workers who were working in the operation department. Data is collected using socio-demographic features questionnaire, indoor air quality questionnaire, a noise pollution questionnaire, and a psychosocial questionnaire. Data is analyzed using SPSS software. Data analysis procedures is being used in this study, including descriptive analysis, hypothesis testing, Pearson correlation and regression analysis. IAQ and psychosocial correlated negatively towards sick building syndrome whereas noise pollution correlated positively towards sick building syndrome. Noise pollution can be classified as moderator variable and contributed to IAQ and psychosocial factors. As a suggestion for future research can use tools and perform assessment at the selected area in a building.

Keywords: Indoor Air quality, Noise pollution, Psychosocial, Sick building syndrome

Abstrak

Sindrom bangunan sakit (SBS) merujuk kepada himpunan simptom berkaitan kesihatan yang dialami oleh penghuni bangunan, sering dikaitkan dengan kualiti persekitaran dalaman yang lemah. Fenomena ini dipengaruhi oleh pelbagai faktor, termasuk kualiti udara dalaman, pencemaran bunyi, dan unsur psikososial dalam persekitaran binaan. Pengudaraan yang lemah, kehadiran sebatian organik meruap (VOC), dan sistem penapisan udara yang tidak mencukupi menyumbang dengan ketara kepada kemerosotan kualiti udara dalaman, yang membawa kepada ketidakselesaan pernafasan, sakit kepala dan keletihan di kalangan penghuni bangunan. Pada masa yang sama, pencemaran bunyi, yang timbul daripada sumber luaran dan dalaman, memburukkan tahap tekanan, mengganggu tumpuan dan menjejaskan kesejahteraan keseluruhan. Selain itu, faktor psikososial, seperti tekanan di tempat kerja, kekurangan sokongan sosial dan tekanan persekitaran, menguatkan lagi kesan kesihatan negatif yang dikaitkan dengan SBS. Sindrom bangunan sakit terdiri daripada pelbagai gejala tidak spesifik yang berlaku pada penghuni bangunan. Perasaan tidak sihat ini meningkatkan ketidakhadiran sakit dan menyebabkan penurunan produktiviti pekerja. Oleh itu, objektif kajian ini adalah untuk menyiasat hubungan antara kualiti udara dalaman, pencemaran bunyi, faktor psikososial dan sindrom bangunan sakit di kalangan pekerja pembuatan. Kajian ini dijalankan di salah sebuah syarikat pembuatan di Kulim Hi- Tech Park. Sampel termasuk 102 pekerja yang bekerja di jabatan operasi. Data dikumpul menggunakan soal selidik ciri sosio-demografi, soal selidik kualiti udara dalaman, soal selidik pencemaran bunyi, dan soal selidik psikososial. Data dianalisis menggunakan perisian SPSS. Prosedur analisis data digunakan dalam kajian ini, termasuk analisis deskriptif, ujian hipotesis, korelasi Pearson dan analisis regresi. IAQ dan psikososial berkorelasi negatif terhadap sindrom bangunan sakit manakala pencemaran bunyi berkorelasi positif terhadap sindrom bangunan sakit. Pencemaran bunyi boleh dikelaskan sebagai pembolehubah penyederhana dan menyumbang kepada faktor IAQ dan psikososial. Sebagai cadangan untuk kajian akan datang boleh menggunakan alatan dan melakukan penilaian di kawasan terpilih dalam sesebuah bangunan.

Kata kunci: Dalaman, Kualiti udara, Pencemaran bunyi, Psikososial, Sindrom bangunan sakit

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LIST OF ABBREVIATION

WHO	World Health Organization
SBS	Sick Building Syndrome
BRI	Building Related Illness
MPMA	Malaysian Plastics Manufacturers Association
STC	Sectorial Training Committee
E&E	Electrical & Electronics
ICOP	Code of Practice on Indoor Air Quality
VOC	Volatile Organic Compound
UFP	Ultra Fine Particles
NIHL	Noise Induced Hearing Loss
ONRHD	Occupational Noise Related Hearing Disorder
dB	Decibel
dB(A)	Decibel Weighted
LAeq	Equivalent Continuous Sound Pressure
DOSM	Department of Statistics Malaysia
HAP	Hazardous Air Pollutants
CO ₂	Carbon Dioxide
CO	Carbon Monoxide
TVOC	Total Volatile Organic Compound
DOSH	Department of Occupational Safety & Health
PEL	Permissible Exposure Limit

DCS	Demand-Control-Support Model
O ₃	Ozone
HVAC	Heating, Ventilation and Air Conditioning
Hz	Hertz
ILO	International Labor Organization
M	Mean
SD	Standard Deviation
IV	Independent Variable
DV	Dependent Variable
OSHA	Occupational Safety and Health Administration
PHP	Personal Hearing Protector
PPE	Personal Protective Equipment
OEL	Occupation Exposure Limit



CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The theory of Sick Building Syndrome (SBS) was developed by the World Health Organization (WHO) in the early 1980s. Those who were residing in the alleged building reported experiencing SBS symptoms include headaches, nausea, dizziness, skin reactions, non-specific hypersensitivity, mental weariness, and symptoms in the eyes, nose, throat, and lower airways. After leaving the premises, the symptoms of SBS usually decreased or disappeared.

The term of 'Sick Building Syndrome' is used to describe where individuals in a building suffer sudden health and comfort issues that seem related to their time spent indoors, without a specific ailment or cause being pinpointed to building pollutants (Sick Building Syndrome, 1991). According to James, (1994) building-associated sickness is classified into two distinct categories: sick building syndrome (SBS) and building-related illness (BRI). Not included in these categories are diseases that have a prolonged period between exposure and the development of symptoms for an example lung cancer caused by exposure to radon. SBS is characterized by a collection of ambiguous, primarily neurobehavioral subjective symptoms including memory impairment, headaches, depression, dizziness, and respiratory issues such as chest constriction, coughing, and difficulty breathing. Concerns about "sick" buildings are frequently associated with symptoms of mucous membrane irritation, including burning eyes, noses, throats, and sinuses.

In 2022, Nur Shahidah Nazri said that eight out of ten buildings have potential to have SBS according to her inspection. Moreover, she said Malaysians should increase their awareness of the

illness, as it not only poses significant health hazards but also impacts work productivity and performance. Most of these cases indicate that over 20 percent of the individuals residing in the building experience symptoms such as headache, sleepiness, and rashes. According to building surveying specialist Md. Nadzari Mohd Jalil, SBS affects people differently depending on their immune system and metabolism. This explains why some employees in the same building experienced symptoms while others did not. Dr. Amir Hamzah Abdul Latiff, President of the Allergy and Immunology Association Malaysia, states that 30-40% of individuals are afflicted by sinusitis allergies due to inadequate indoor air quality in building environments (Ahmad, 2023). Malaysia comprises a diverse range of manufacturing industries. Plastic manufacturing industries play a major role in part of Malaysian industries.

The Malaysian Plastics Manufacturers Association (MPMA) has highlighted the significant role of the manufactured plastics sector in supporting vital economic sectors during the Covid-19 pandemic, as evidenced by a robust recovery in sales. Data from the Department of Statistics Malaysia (2021) indicates that the sales of produced plastics rose by 23% relative to the prior year, totaling RM38.68 billion in the initial eight months of 2021, as reported by MPMA president Datuk Lim Kok Boon. The export of plastic items experienced a 21% growth during the same time, rising from RM8.63 billion to RM10.43 billion. The significant surge was ascribed to the commencement of many market sectors, both domestic and global. Eddie Fong, Chairman of the Plastics Sectorial Training Committee (STC), announced that industry experts have created the Industrial Skills Framework specifically for the Malaysian Plastics Industry, with a specific focus on the Injection Molding sector. The Malaysian plastics injection molding sector plays a crucial role in supporting several manufacturing sectors, including Electrical & Electronic (E&E), Automotive, Industrial, and Household items. The plastic manufacturing process consists of heavy

processes involving injection molding machines. It is a repetitive process in a hot, heavy working environment. To this, it will impact the workers by surrounding environment and processes in terms of air, noise, and social environment.

In 2010, the Department of Occupational Safety and Health Malaysia established the Industrial Code of Practice on Indoor Air Quality (ICOP). This code outlines the specific parameters for indoor air quality and their permitted limits. According to Ayuni Ainaa, (2021) prior to ensuring a satisfactory Indoor Air Quality (IAQ), it is crucial to adhere to the recommended limits for each IAQ parameter. The supply and movement of adequate ventilation air, control of airborne pollutants, and preservation of ideal temperatures and relative humidity levels are essential elements of good indoor air quality. The permissible air temperature falls within the range of 23 °C to 26 °C, with the relative humidity ranging from 40% to 70% and the air movement ranging from 0.15 m/s to 0.50 m/s. The inability to address the challenges of poor indoor air quality (IAQ) promptly and effectively could have a catastrophic impact on human health. Sick Building Syndrome (SBS) has a detrimental effect on residents' health and well-being, resulting in severe health issues and discomfort (Hosseini, 2018). Kuala Lumpur has been discovered to have a hidden threat known as sick building syndrome (The Sun online, 2018). Insufficient ventilation can result in Sick Building Syndrome (SBS) (Zuraimi, 2019). Proper ventilation in offices to mitigate Sick Building Syndrome (SBS). Moreover, SBS can impact workplace happiness, work stress, and productivity, as stated by (Surahman, 2019). According to Joshi, (2008) volatile organic compound (VOC), such as formaldehyde, can be released by adhesives, carpeting, upholstery, produced wood goods, copier equipment, insecticides, and cleaning supplies. Environmental tobacco smoke is a major source of VOCs, other harmful substances, and respirable particle matter. High quantities of certain VOCs have been shown to have both acute and long-term negative consequences, and some are even proven carcinogens. Printer emissions, consisting of ultra-fine particles (UFPs)

emitted into the workplace air when toner is burned while printing, can cause specific (SBS) symptoms. Printer waste may include several chemicals that can cause Sick Building Syndrome symptoms in some office workers who are susceptible to them.

Based on WHO, Asian laborers experience the highest number of healthy years lost because of Noise Induced Hearing Loss (NIHL) compared to laborers from other regions. This has been driven by the continual rise in the number of industries being established in Asia, which require manpower to enhance their production. In Malaysia, occupational noise-induced hearing loss (NIHL), encompassing NIHL, hearing impairment, and Permanent Standard Threshold Shift, was the most prevalent occupational ailment in 2021, with 3,648 documented cases about 68.9%. While the numbers may not encompass the full Malaysian populace, it is evident that NIHL is a substantial issue affecting several employees in Malaysia (Halim, 2023). There are further cases that have not been reported by individuals who have been living with Occupational Noise Related Hearing Disorder (ONRHD) for their whole lives. According to Faridah, (2020) industrial environments often exhibit noise levels exceeding 85 decibels (dB), a threshold considered to pose a risk of hearing impairment with prolonged exposure. For instance, noise levels at a typical construction site might attain 90 to 100 dB, while certain manufacturing processes may produce sounds above 110 dB. Workers exposed to elevated levels without adequate protection may experience irreversible hearing loss and additional health issues. Faridah, (2020) asserts that industrial environments sometimes exhibit noise levels exceeding 85 decibels (dB), a threshold believed to pose a risk of hearing problems with prolonged exposure. Noise levels at a typical construction site can attain 90 to 100 dB, while certain manufacturing processes may produce

sounds exceeding 110 dB. Workers exposed to elevated levels without adequate protection may experience irreversible hearing loss and additional health issues.

Furthermore Lahtinen, (1998) said that there are few circumstances significant impacts were observed with aspects of the psycho-social workplace, including excessive workloads and inadequate assistance. The physical location of office buildings appears to be less important than elements of the psycho-social work environment when it comes to explaining differences in the prevalence of symptoms. However, despite professional stress, there is still a connection between sick block syndrome and workers' symptoms. Sick building syndrome (SBS) is commonly linked to high levels of work stress, discontent, strained interpersonal connections, and ineffective communication. According to Lu, (2018) the condition is believed to be exacerbated by a combination of environmental sensitivity and stress. Distinct work-related pressures are associated with distinct SBS symptoms. Workload and job conflict have a strong correlation with general symptoms such as headache, excessive weariness, sensation of cold, or nausea. Overcrowded work environments and low job satisfaction are linked to upper respiratory problems.

In summary, a healthy workplace, according to the World Health Organization (WHO), offers organizational, social, psychological, and physical conditions that safeguard and advance the health and safety of every employee in a company. According to Stoewen, (2016), the best kind of workplace is one that promotes health. Employees exhibit more dedication and productivity when they perceive appreciation, safety, and well-being. Workplace health can boost employee retention, satisfaction, and productivity. A proactive approach to addressing sick building syndrome can contribute to cost savings and economic sustainability. Then, governments and regulatory bodies often establish occupational health and safety standards to ensure the well-

being of workers. This study on sick building syndrome impact can help manufacturers comply with these regulations and demonstrate corporate responsibility. This is particularly relevant as societal expectations for ethical and responsible business practices continue to rise.

1.2 Problem Statement

Manufacturing sector plays a vital role in Malaysia's economy. Day by day, the number of manufacturing industries is increasing in our country. The Department of Statistics Malaysia reported that there are a total of 1,028,301 individuals employed in the domestic manufacturing industry. According to the Department of Statistics Malaysia (DOSM), National Occupational Disease showed double-digit growth (58.9%) in 2022, recording 34,216 cases in total, up from 21,534 cases in 2021. Plastic manufacturing is one of the primary subsectors of the manufacturing industry in Malaysia.

Damini, (2024) expressed that the production of plastic is a multifaceted procedure that encompasses numerous stages, equipment, and chemicals. Although plastic items are integral to our daily existence, plastic manufacturing facilities may provide certain risks. The plastic production process can emit fumes, vapors, and dust into the air, presenting considerable hazards to workers' respiratory health. Respirators, including masks, are essential for safeguarding workers from inhaling hazardous compounds that may result in lung damage or other respiratory ailments. Plastic production plants can produce significant noise, perhaps resulting in hearing impairment over time. Employers are required to furnish hearing protection to employees and implement measures to mitigate noise levels where feasible. In plastic manufacturing, numerous chemicals are utilized and generated as byproducts of operational processes. Certain substances can adversely affect human health upon exposure ("Health Issues in the Plastics Industry," 2023). The working

environment or work demands arise from the necessity to do intricate activities in high-stress circumstances, characterized by substantial mental burden and exposure to harassment and workplace violence, among other elements, together referred to as psychosocial factors (Hernandez, 2020).

Research undertaken by the World Health Organization (WHO) in 2005 found that indoor air pollution is responsible for over 2 million premature deaths annually. Lim, (2016) further elucidated that individuals residing in industrialized nations often allocate approximately 80% of their lifespan within an enclosed space. A significant proportion of individuals who spend a considerable amount of time indoors are at a heightened risk of having (SBS). SBS, refers to a health issue that arises from the presence of chemical and biological pollutants in the indoor environment, as well as elements such as room temperature and humidity by (Vesitara, 2019). Nevertheless, sick building syndrome continues to be prevalent among buildings in Malaysia. Samani, (2021) addressed that the manufacturing of plastic items can result in the emission of volatile organic compounds (VOCs) and other air pollutants, which can have detrimental effects on the well-being of workers. Aside from VOC, there are many gases produced from the plastic manufacturing building.

According to Air Impurities Removal System Organization, 2022, inhalation of elevated concentrations of these contaminants can lead to respiratory ailments, migraines, and several other health complications. Workers in the plastic manufacturing business frequently encounter chemical vapors that are released during the production of raw materials and the processing of polymers. When working with thermoforming resins, which can release hazardous air pollutants (HAPs) and volatile organic compounds (VOCs), workers may be exposed to plastic fumes. The chemical reactions that take place when resins are heated result in the production of these materials.

Additionally, Michael, (2000) said that workers handling raw materials during plastic manufacture may generate particulate matter in addition to (VOCs) and (HAP) emissions through processes such as grinding, cutting, or other finishing techniques. The old building has been seen to have inadequate ventilation, resulting in an increase in carbon dioxide (CO₂) levels. The insufficient ventilation per individuals and the increased concentrations of chemical pollutants indoors can result in the prevalence of sick building syndrome (SBS). According to Roh, (2021) outdoor air pollutants, such as fine particulate matter, carbon monoxide (CO), and volatile organic compounds (VOCs), can adversely impact indoor air quality (IAQ). Carbon dioxide (CO₂) serves as a metric for evaluating the efficiency of a building's ventilation system. Makhbul, (2020) stated that ozone generation resulting from the equipment within the structure. Ozone emissions from copier machines and organic solvents, among other sources, can contribute to Sick Building Syndrome (SBS), which can have adverse effects on health.

Fluhart, (2020) expressed that indicators resulting from inadequate indoor air quality (IAQ) can readily be mistaken for other ailments, such as common colds, allergies, and influenza. IAQ, or indoor air quality, can produce a range of symptoms including headaches, coughing, sneezing, eye irritation, dizziness, nausea, exhaustion, lung or sinus congestion, and skin irritation. However, it can be challenging to directly link these symptoms to indoor air quality (IAQ).

In summary, if employees experience an amelioration in their condition upon departing the premises, it is possible that these symptoms are connected to inadequate indoor air quality (IAQ) within the workplace. IAQ affected by multiple air pollutants based on the conditions of the buildings. For example, carbon monoxide (CO), carbon dioxide (CO₂), volatile organic compound (VOC), total volatile organic compound (TVOC), and hazardous air pollutants (HAP) are common

air pollutants can be found in plastic manufacturing building, which is SBS, and it causes severe health issues to the workers.

Moreover, the noise levels inside the building can exacerbate stress for inhabitants, regardless of whether the noise is mild or loud, continuous, or sporadic, and so forth. Buildings often experience ambient noise and the shrill sound of ringing telephones, which contributes to noise pollution, particularly in buildings with open plan layouts (Passarelli, 2009). Occupational noise denotes the intensity of sound energy to which an employee's auditory system is subjected during industrial labor. The noise level (L_{Aeq}) recorded at a plastic button factory in Japan ranged from 58 to 92 dBA. 30% of their measurement points exhibited noise levels exceeding 85 dBA. In addition, most of their employees were subjected to noise levels ranging from 69 to 76 dBA, whilst the second group involved in the manufacturing of plastic buttons experienced continuous exposure to noise levels between 82 and 86 dBA. Nevertheless, the officers were subjected to a noise level of 58 to 62 dBA, as reported by (Morioka, 2000). The noise levels impact workers and their well-being.

Kroemer, (2001) stated that noise is a psychological and subjective sensation. Single, brief tones of weak magnitude may be classified as noise in specific circumstances. Indeed, powerful, enduring, intricate sounds might be considered as noise in different situations. Noise can be defined as any sound that is irritating or surpasses a level of 75 dBA. The level at which noise becomes annoying varies. The outcome varies based on factors such as an individual's sensitivity and mental state. Noise typically elicits adverse emotions such as surprise, frustration, rage, and terror. Mokhtar, (2007) said that noise can also cause a delay in the start of sleep, rouse a person up from sleep, or disrupt someone's rest, making it challenging to hear pleasant noises. Noise can have both transient and lasting effects on body chemistry, as well as temporary or permanent

changes to one's hearing function. These factors may also disrupt certain human sensory and perceptual capacities, leading to a decline in task performance. To understand the noise level at various locations within the organization, conducted a noise risk assessment.

Table 1.1

Initial Noise Risk Assessment (2020)

SEG	Initial			Positive Initial		
	Lex (8hr)	Max	Peak	Lex (8hr)	Max	Peak
FOUP Operation	86.7	111.7	132.3	83.8	108.2	132.2
WHS Operation	86.6	114.0	<u>149.6</u>	83.8	117.2	<u>141.9</u>
Maintenance Workshop	86.4	116.6	<u>150.4</u>	85.8	109.6	132.9
DSS Operation	83.4	108.3	131.8	87.0	106.2	126.4
FEP Operation	82.4	117.6	126.6	78.8	101.9	133.9
EMT Workshop	86.6	116.4	132.1	88.3	122.3	135.2
B1 Cleanroom	84.0	110.7	128.0	86.1	112.1	126.6
2nd Ops Milling	87.7	129.7	<u>148.1</u>	79.3	106.5	<u>144.5</u>

Note: Above excessive noise is in **Bold** and Underline

Source: Data from Organization's Initial Noise Risk Assessment, (2020)

In summary, the table 1.1 shows that excessive noise levels and peak levels can be noticed. The buildings often experience high noise levels in certain areas or most of the department. Basically, in the plastic manufacturing industry building which is called SBS due to the heavy or robotic machinery/ process design, a high noise level can be observed, which impacts workers performance and health issues.

Adding to another factor, Rostron, (2008), it is reasonable to assume that sick building syndrome (SBS) is more than just a physical issue. Sick Building Syndrome (SBS) is a psychological problem that is exacerbated by factors like job satisfaction, stress at work, and a lack of local control. According to Spurgeon (1997), the variables include the participants' views and belief systems, particular personality traits and behavioral patterns, and the presence of

continuing stress or underlying psychological suffering. Rostron (2008) asserts that the influence and involvement of the media, pressure groups, and the legal system, as well as the employees' evaluations of the managers' and experts' skill and reliability, will all have an impact. The desire to be in charge of one's own workspace is a fundamental need for individual employees. The need for independence from outside rules and restrictions and the capacity to direct one's own actions are closely related to the need for control. In response to losing control over their behavior, people reaffirm their independence and display symptoms of SBS. A state of 'learnt helplessness', marked by continuous SBS symptoms, is anticipated to result from a persistent lack of control. Although the results of "learnt helplessness" are difficult to change, the association can be changed into a good habit or feeling by consistent positive reinforcement. When the habit or emotion turns negative or job demand becomes high, it will lead to job stress.

Probably more significant contributors to symptoms than internal environmental physical and chemical factors are job stress and dissatisfaction. Due to their more regular work, clerical staff members are more likely than professional staff to have symptoms. Because a higher study of the surroundings may occur when focus falters, clerical staff members will be much more conscious of even small changes in the workplace, particularly if they have been inactive for extended periods of time. People who have greater control over their surroundings and more engaging, interesting jobs report much less symptoms (Building Use Studies, 1988; Health and Safety Executive, 1995). When evaluating the prevalence of eye issues and happiness with illumination, the percentage of work time spent in front of computers is highly significant. Often, people assume that computers are the source of the issue when the work done on the computers is the root of the issue (Jones, 2006). Job such as prolonged computer use and the pressure to meet work criteria can contribute to the causes of sick building syndrome (SBS). These factors can lead

to stress and anxiety, particularly when working in a stationary position for extended periods of time (The Environmental Illness Resource (EIR), 2007).

According to Dr. Wyon, (1995), the productivity can increase by up to 7% when individual environmental control systems are used, thereby leading to a decrease in absenteeism. Occupants of the building will experience a sense of control over their working environment, which will reduce their susceptibility to displaying signs of Sick Building Syndrome (SBS). Psychological factors have an impact to the workers mentally, which leads to physical illness as well. A workplace includes three branches for psychosocial factor which are job demand, job control and social support. Occupations characterized by high demand, limited control, and minimal social support are associated with the greatest risk of sickness (Karasek, 1979).

In a nutshell, SBS is caused by a combination of psychological, noise, and indoor air quality (IAQ) variables. These factors come from the building environment which affects workers well-being at the workplace. These factors would have been lost or an issue for the organization if it hadn't rectified it in the first place. The aim of this study is to close the gap between the plastic manufacturing industry's psychosocial factors and sick building syndrome (SBS), indoor air quality, and noise pollution.

1.3 Research Questions

Based on the problem statement, this study's primary goals are to find out factors lead to workplace illness among workers in manufacturing companies. The three primary questions this study aims to address are:

- a) Is there a relationship between indoor air quality and sick building syndrome?
- b) Is there a relationship between noise pollution and sick building syndrome?
- c) Is there a relationship between psychosocial (job control/job demand/social support) and sick building syndrome?
- d) Do indoor air quality, noise pollution and psychosocial influence sick building syndrome?

1.4 Research Objectives

The objectives of this are as follow:

- a) To examine the relationship between indoor air quality and sick building syndrome.
- b) To examine the relationship between noise and sick building syndrome.
- c) To examine the relationship between psychosocial (job control/job demand/social support) and sick building syndrome.
- d) To examine the influence of indoor air quality, noise pollution and psychosocial towards sick building syndrome.

1.5 Significance of Study

The purpose of this study creates a healthy manufacturing working environment among employees and employers. Employees exhibit more dedication and productivity when they perceive appreciation, safety, and well-being. Employers are more likely dedicated to their company development and reputation.

For the employees, a healthy working environment can also contribute to the reduction of stress levels. When employees enjoy a sense of ease and security in their workplace, the likelihood of them experiencing elevated levels of stress decreases. Engaging in this activity can result in enhanced mental and physical well-being, as well as greater job productivity. Reduced employee stress levels positively correlate with increased creativity and the generation of innovative ideas (Kumar, 2023).

Every day, employees arrive motivated to make a difference in the world, actively facing challenges and fully engaged in their work. If a workplace follows the adage "To err is human, to forgive divine," it promotes a healthy environment. Making mistakes is an inevitable occurrence that is universally disliked. In a conducive work atmosphere, individuals exhibit transparency by openly acknowledging their mistakes without attempting to conceal them, and refrain from attributing blame to others (The team, 2022).

Ensuring a tidy and organized workspace is essential for fostering a favorable work atmosphere and enhancing employee well-being. Maintaining a tidy workspace can also contribute to minimizing the transmission of pathogens and diseases, resulting in a more robust workforce in terms of health. It is crucial to consider the general ambiance of the workplace. Utilizing natural lighting, incorporating plants, and incorporating other components can contribute to the creation of a serene environment that enhances productivity (Arivu Recruitment and Consulting, 2023).

For the employers, when employees experience satisfaction with a company's culture and a healthy work environment, it results in an enhancement of the organization's corporate image. A company's commitment to maintaining a healthy workplace demonstrates its dedication to employee well-being, a quality that job seekers value. It differentiates the organization from its competitors and enhances its ability to attract a varied and highly skilled group of individuals. Additionally, it entices a larger clientele. Productivity in a company is enhanced when employees are in good health, leading to an increase in the quality of their work. Consequently, the preference of customers and clients will be inclined towards the items and services offered by the firm, resulting in more earnings that can be allocated towards enhancing the welfare of employees (Labitoria, 2022).

An organization that fails to prioritize the well-being of its personnel will experience an increase in both absenteeism and tardiness. This is attributed to employees neglecting their well-being in unfavorable work conditions, leading to illness or absenteeism. Organizations that invest effort in fostering a conducive work environment will experience a decrease in health-related issues and sickness, resulting in a reduction in absenteeism and tardiness. Additionally, it demonstrates the perspective and concern that firms have for their employees, thereby enhancing employee morale and motivation towards their work (Labitoria, 2022).

As summary, fostering a conducive work environment enhances the well-being of individuals inside the organization, enabling them to perform optimally in terms of physical, emotional, and psychological aspects.

1.6 Scope and Limitation of Study

The study's respondents are workers in the manufacturing industry (operation department) in plastic manufacturing industry in Kedah. This company specializes in manufacturing of plastic products, assembled and systems that filter, safeguard, and convey key materials utilized in the semiconductor device creation process. Employees in operation department is working throughout the day/shift. Per shift working hours is 12 hours and 8 hours depends on job title. Work nature of the employees from operation department usually handling machines or jigs and working environment surrounded machines in occupied building floor.

The research sample includes:

- a) Supervisor
- b) Engineer
- c) Technician
- d) Production Operator
- e) General worker



The total population of employees available for participation in this study amounted approximately 100 people. The employees are a mixture of various nationality, including Malaysian, Indonesian, Bangladeshi. Nonetheless, this study does not consider the nationality of employees in the results. The research design conducted using a quantitative method which is a survey questionnaire. The survey questionnaire includes the independent variables of the study, which are indoor air quality, noise and psychosocial. These variables were included in this study due to the main factors causing sick building syndrome (SBS) to the manufacturing workers. Indoor air quality and noise disorder are caused by the process or work nature from the building environment whereas psychosocial affected workers due to the building surroundings and job nature. The combination of these factors

causes health issues to the workers for temporary or permanent disorder. To this, the questionnaire included type of health issues facing by the manufacturing workers.

1.7 Definition of Key Terms

The phrase that is covered in this study are such as indoor air quality, noise, psychosocial, and sick building syndrome.

a) Indoor Air Quality

According to DOSH (2010), indoor air quality refers to the impact of indoor air on an individual's health, comfort, and productivity. It may encompass temperature, humidity, mold, bacteria, inadequate ventilation, or contact with other substances. The increase in interior air pollutants is partially caused by the separation of indoor spaces from the natural outdoor environment in tightly sealed buildings.

b) Noise

Behar, (2021) says that noise in the workplace refers to all audible sounds, whether intentional or unintentional, and is a prevalent hazard present in various environment. Extended exposure to loud noise can cause permanent harm to a person's hearing and diminish their quality of life. Neither surgery nor a hearing aid can remedy this form of hearing impairment. Brief exposure to loud noise can result in a temporary alteration in hearing.

c) Psychosocial

Martikainen, (2002) mentioned that psychosocial pertains to the interactions among individuals with their cognition, actions, and societal surroundings. The phrase pertains to the interaction between mental health, psychological elements, and the environment, and their impact on an

individual. The term "psychological" pertains to aspects, emotions, and encounters associated with the human mind and mental well-being.

d) Sick Building Syndrome

Joshi, (2008) discussed in his study Sick building syndrome (SBS) is a condition characterized by nonspecific symptoms experienced by people occupying a building. Ill health leads to higher rates of sickness absence and reduced worker productivity. As this illness is becoming a significant work danger and a matter for concern in management.

1.8 Organization of the Thesis

There were five chapters in the research paper. Chapter 1 explained about introduction which apply the study's background, problem statement, research questions, research objectives, study scope, study importance, and definitions of important terms.

Chapter 2 explained about main literature regarding the indoor air quality, noise, psychosocial and sick building syndrome. From the previous study, analysis and understanding the gap between independent and dependent variables.

Chapter 3 explained about research methodology, framework, design of the study and measurements. Methods of data collection and analysis are also discussed in this chapter.

Chapter 4 discussed the findings from statistical analysis and offered detailed interpretations. Hypothesis testing or models being discussed in this chapter.

Chapter 5 is the research questions, objectives, and study summary are the main topics of discussion while discussing the findings. Discussed limitations and suggestion for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discussed the previous literature that have been done related to sick building syndrome especially effect of health issues among workers at manufacturing industry. The conceptual definition of each component comes first, and then a review of the research pertaining to building disease.

2.2 Conceptualization of Variables

2.2.1 Sick Building Syndrome

"Sick building syndrome" (SBS) refers to instances where individuals in a building suffer from immediate health and comfort issues that seem to be related to the time they spend within the structure, but no specific ailment or cause can be determined. The complaints may be confined to a certain room or area, or they may be prevalent throughout the entire facility. On the other hand, the term "building related illness" (BRI) is employed when signs of a diagnosable illness are detected (Sick Building Syndrome, 1991). The symptoms exhibit a positive correlation with the duration individuals spend within the premises and ameliorate with time or completely vanish when individuals are absent from the premises. Sick Building Syndrome causes significant impairment in individuals' professional performance and personal relationships, leading to a large decrease in output (Sick Building Syndrome WHO Europe, 2002). The Sick Building Syndrome (SBS) presents itself as a diverse range of health symptoms, including irritation of the mucous membranes (such as runny nose, nasal congestion, sore throat, and eye irritation), asthma symptoms (such as chest tightness and wheezing), neurotoxic effects (such as headaches, fatigue,

and irritability), gastrointestinal disturbances, dry skin, and sensitivity to odors. These symptoms may manifest in individuals occupying office buildings, schools, public buildings, hospitals, and recreational facilities. The swift dissemination of symptoms frequently results in the virtual shutdown of the establishment, and the remission of the sickness also occurs shortly after departing the facility (Laumbach, 2008 in Takeda, 2009).

2.2.2 Indoor Air Quality (IAQ)

Indoor Air Quality (IAQ) pertains to the quality of air inside and in the vicinity of buildings and structures, particularly in relation to the well-being and comfort of the people occupying the building (Indoor Air Quality (IAQ), 2024). Research conducted in North America has revealed that persons typically allocate 87% of their time to indoor environments. Given that individuals spend most of their time inside, the presence of indoor air pollution has a substantial influence on both human health and productivity in the workplace (Mannan, 2021). Inadequate ventilation in buildings is associated with a higher prevalence of indoor air quality issues. Indoor environmental parameters are influenced by the perceived comfort and hygienic standards of indoor physical, chemical, and biological substances (Juhasova, 2017). Indoor air quality pertains to the concentration of pollutants and thermal conditions (temperature and relative humidity) within edifices, which can impact the health and well-being of the people inside. The increasing prevalence of chemical pollutants in consumer and commercial products, the trend towards more airtight building structures and reduced airflow for energy conservation, and the push to delay maintenance and other building services to cut expenses have contributed to indoor air quality (IAQ) issues in most of the buildings. Individual susceptibility to pollutants can vary significantly from person to person, resulting in different reactions to the pollutants in some situations. Certain

individuals may develop sensitization to biological or chemical contaminants following frequent or prolonged exposure (Khullar, 2017).

2.2.3 Noise Pollution

Individuals engaged in the production process are consistently exposed to the effects of noise, which is emitted throughout technological procedures. The produced noise exacerbates the working circumstances and has a detrimental impact on the human being (Botirov, 2022). Sound waves are oscillations of air particles that propagate from a sound source to the ear. Sound is commonly characterized by its amplitude, which determines its loudness, and its frequency, which determines its pitch (Berg, 2024). Industrial workers who are consistently exposed to high-intensity noise over a prolonged period are largely at risk of developing permanent hearing loss (Mamat, 2020). According to Occupational Safety and Health Administration (OSHA), 2020 has established a permissible exposure limit (PEL) of 85 dBA for workers during an 8-hour work shift. Exceeding this limit of noise levels might result in irreversible hearing impairment and other detrimental health conditions. Within industrial environments, the intensity of noise frequently surpasses this limit, resulting in certain workers being subjected to levels as elevated as 120 dB. It has shown that both community and occupational noise can have several negative impacts, in addition to causing hearing damage. These effects include impairments in communication, performance, and behavior, as well as non-auditory physiological effects, stress, and aggravation (Popescu, 2005).

2.2.4 Psychosocial

Work stress is commonly recognized for its detrimental effects on productivity and job satisfaction among individuals in many occupations. Job stress and strain were seen to be contributing factors to absenteeism, low worker morale, a high accident rate, and poor turnover rates. Negative perceptions of indoor air quality, even if not objectively poor, can lead to psychosomatic symptoms such as headaches, dizziness, and fatigue. This can create a cycle where occupants believe the building is making them sick, leading to real physical symptoms (Tiwary, 2013). According to Karasek, (1990) in Runeson, (2006) the combination of high demands, poor control, and low support is a psychological stressor that has been proven to produce a range of health issues. This can be assessed using the demand-control-support model (DCS). High demands refer to a situation when there is an excessive amount of work to be completed within a limited timeframe, extending over a long period of time. Lack of control refers to a situation where one does not possess sufficient authority or power to dictate the way work is carried out daily. Inadequate support refers to the lack of sufficient assistance from colleagues and supervisors. Research has demonstrated that an imbalanced psychosocial work environment significantly raises the likelihood of developing cardiovascular disease, especially when there is a mix of excessive job expectations, limited control, and insufficient support from supervisors or coworkers.

2.3 Past Literature Review

2.3.1 Relationship between Indoor Air Quality (IAQ) and Sick Building Syndrome

The term "Indoor air quality" (IAQ) describes the temperature and concentrations of pollutants within a structure. These factors can have an impact on the inhabitants' comfort, health, and productivity. Over the past 10 years, an increasing amount of scientific data has suggested that indoor air quality can be more contaminated than outside air quality. The amount of time spent indoors raises concerns about indoor air quality. Poor indoor air quality (IAQ) in buildings can be caused by a variety of factors, including nearby sources of pollution, poorly planned and maintained ventilation systems, and building construction or restoration (Zainal, 2019).

Adding to this, a study was conducted by Nag, (2018) said that SBS is the result of the combined influence of numerous variables, including occupant behaviors, building features, indoor environmental quality, and building wetness. A building resident may be diagnosed with SBS if they exhibit at least one symptom of the disorder, two or more symptoms appear at least twice, and their symptoms quickly go away after leaving their workstation or the building.

According to Zubir, (2022) the presence of insufficient ventilation systems, indoor air contaminants, elevated moisture and humidity levels, cleaning agents, and human activities can all contribute to indoor air quality (IAQ) problems within a building. Old buildings often contain elevated levels of indoor air pollutants, which can originate from sources such as new furniture, freshly painted walls, copying machines used in open areas, wood products, and vaporized chemicals. The presence of insufficient ventilation and increased concentrations of indoor chemical pollutants can contribute to the occurrence of Sick Building Syndrome (SBS). Typically, individuals who work in buildings with a high level of indoor pollutants tend to experience

symptoms of Sick Building Syndrome (SBS) only when they are within the building. The symptoms abate when returning home. Nevertheless, indoor air contains multiple gases that impact workers at the workplace. The multiple gases may vary depending on the building's manufacturing environment.

Walder, (2023) said that the quality of indoor air is a crucial determinant of people's overall health and is of utmost significance when planning the layout of rooms, offices, and buildings. The primary factors for maintaining optimal indoor air quality are air temperature, humidity, and CO₂ levels. The quality of indoor air is influenced by multiple factors that can impact the occurrence and worsening of sick building syndrome. Inadequate ventilation can result in the accumulation of pollutants, such as volatile organic compounds (VOCs) or other chemicals, within a room due to a lack of proper air circulation. Indoor environments can contain a diverse array of pollutants and allergens, including dust mites, mold spores, animal dander, and pollen. Breathing in these particles might elicit allergic reactions and respiratory issues. The optimal indoor humidity range is often between 40% and 60%. Excessive indoor humidity fosters the proliferation of mold and germs, hence adversely affecting air quality and human health. Insufficient humidity in indoor air can lead to desiccation of mucous membranes, resulting in pruritus of the eyes, nose, and throat.

Moreover, the indoor air quality (IAQ) is influenced by outdoor air pollutants, including fine particulate matter, carbon monoxide (CO), volatile organic compounds (VOCs), and ozone (O₃). Carbon dioxide (CO₂) serves as a measure of a building's ventilation efficiency. Inadequate indoor air quality (IAQ) can lead to discomfort and contribute to the prevalence of Sick Building Syndrome (SBS) among individuals in a building. A wide range of symptoms, including mucous membrane irritation (rhinorrhea, nasal congestion, sore throat, eye irritation), asthma symptoms

(chest tightness, wheezing), neurotoxic effects (fatigue, irritability, headache), gastrointestinal disturbance, skin dryness, and odor sensitivity, are indicative of (SBS) (Aziz, 2023).

Zainal, (2019) in their study the primary cause of Sick Building Syndrome (SBS) is the inadequate circulation and contamination of ventilation within the building, both from internal and external sources. Extended exposure to elevated levels of ventilation pollutants such as carbon monoxide (CO), carbon dioxide (CO₂), and volatile organic compounds (VOCs) can lead to symptoms ranging from headaches and fatigue to difficulty breathing. Likewise, an atmosphere characterized by high temperatures, whether too hot or cold, elicits unfavorable physical responses in employees, particularly those who are vulnerable to such severe temperatures. In addition, arid and devoid of moisture conditions may result in coughing, a painful throat, and, in certain instances, an elevated susceptibility to dehydration, exacerbating the strain on the human body.

Indoor air quality (IAQ) refers to air pollution from the building environment. It is caused by poor ventilation systems, building wetness, cleaning agents, and manufacturing environments. It caused health issues for the workers. In some cases, outdoor air pollution also plays a role for indoor air quality pollution. The air quality may vary depending on the old and new buildings. Usually, old buildings have a high number of air pollutants. Besides that, the air pollutants contain multiple gases, which are fine particles: CO, CO₂, VOC, O₃, and many others. Types of gases may be varied depending on the manufacturing building environment. The indoor air quality has significant relationship to sick building syndrome.

H₁: There is a significant relationship between indoor air quality and sick building syndrome.

2.3.2 Relationship between Noise and Sick Building Syndrome

Buildings depend on mechanical systems to supply ventilation, heating, cooling, and water to the people inside. Nevertheless, these technologies can also give rise to issues related to noise and vibration. Poor functioning, inadequate maintenance, or faulty design of the heating, ventilation, and air conditioning (HVAC) system can lead to issues with excessive noise. Air flowing rapidly via ventilation ducting can also propagate noise throughout a building. In addition, buildings can be subject to many sources of noise, such as office equipment are phones, computers, and fax machines, lighting systems, external noise, and "people noise" arising from discussions and other activities. Both elevated and reduced levels of noise might contribute to Sick Building Syndrome (SBS). As per the Academy of Otolaryngology, continuous exposure to workplace noise over 85 decibels (dB), which is equivalent to the volume of regular conversation, can cause irritation and have negative effects on an individual's health. Additionally, low-level noise is a significant contributing element to Sick Building Syndrome (SBS). Multiple studies have demonstrated that in various regions characterized by low-frequency noise, such as the buzzing produced by fans. Additionally, noises with very low frequency can induce vibrations that fall inside the inaudible range of infrasound, specifically below 20 hertz (Hz). The vibration propagates via structural elements, commonly resulting in cephalalgia and vertigo. Curiously, high frequency sounds like ringing cellphones, human conversations, and computer noises can effectively conceal the impacts of low frequency noise (Schwartz, 2018).

According to Occupational Safety and Health Administration (OSHA), 2020 standards, employers are obligated to calculate the maximum duration of noise exposure for employees, which should not exceed eight hours on average with a limit of 85 dBA. Prolonged exposure to a

constant noise level ranging from 85 to 90 dBA might result in gradual hearing impairment and alterations in the threshold sensitivities. Alnabih, (2021) in their study said that these annoyance reactions are linked to the extent, diversity, and intensity of daily activities. Aggressive industrial noise typically arises from the constant noise produced by machinery, noise caused by the flow of materials, rapid and repetitive movements, as well as the tools used in conjunction with generators and electro-mechanical devices in the work area. Furthermore, the presence of occupational noise exposure was identified in plastic manufacturers because of the specific interaction between plastic goods and the machinery being utilized. The employee working in the building's office environment is also exposed to high levels of noise.

Besides that, the democratization of open workspaces has not only affected construction workers but also the people working in the offices, due to increased noise levels. The purpose of these open-plan workplaces is to foster employee collaboration, facilitate communication, and enhance team unity. Nevertheless, despite being regarded as a representation of nimbleness and contemporary values, they do not have universal acceptance. Indeed, a significant majority of 59% of the employed population report experiencing daily annoyance due to noise pollution at their workplace. It has been determined that the employees' daily noise exposure level must not surpass an average of 85 dB(A) over an 8-hour period, as it poses a risk to their health. While achieving 80 decibels may not always be feasible, research indicates that workplace noise continues to be a bothersome issue that can lead to numerous diseases and pathologies, posing a risk to employee health and compromising job efficiency. Workplace noise not only reduces concentration and cognitive abilities, but also leads to weariness, discomfort, anxiousness, and hampers communication between employees, which can potentially result in work-related accidents (Merseens, 2022).

According to Olalekan Bolaji, (2018) industrial operations are the primary sources of ambient noise in industrial environments. This is a significant challenge as it can have detrimental consequences on the safety and health of both workers and residents in the surrounding area. Typically, industrial workers experience more exposure to elevated noise levels compared to the general population. In several businesses, noise pollution frequently emerges as a prominent element that impacts the auditory health and overall welfare of workers, thus leading to a decline in their productivity. When the industrial environment frequently generates noise, it can lead to health issues for employees.

A study carried out by Subramaniam, (2019) the human ear and nervous system have a maximum threshold for perceiving and processing sound levels. The impact on the human nervous system and comfort level often varies depending on the duration, intensity of noise exposure, and proximity to the source. The impact of noise on human health can be categorized into four groups: physiological effects (such as hypertension, cardiac arrhythmia, and ulcers), psychological effects (including stress and irritability), performance effects (resulting in decreased productivity), and physical effects (such as hearing loss). Sensorineural hearing loss is a disorder characterized by the impairment of the inner ear's hair cells (stereocilia) to transmit auditory information to the brain. Noise-induced hearing loss is the predominant cause of hearing loss resulting from exposure to dangerous levels of noise in a manufacturing facility.

Exposure to noise pollution can cause lasting physical issues and even certain diseases among people. People who work and commute around loud noises and disturbances have a higher risk of having problems with social interactions at the workplace. The advancement of industrial and manufacturing industries has also brought some challenges to the country. It is believed that industrial practices tend to deteriorate a person's hearing ability by a minimum of 20%

(Vattanapratchee, 2020). The operations of textile production include spinning, weaving, knitting, and dyeing. The printing, finishing, and sewing sections are high with noise at the textile industry. Generally, noise levels between 70-100 dB are recorded at the workplace. Permanent hearing loss is possible if the sound level exceeds 100 dB. Serious damage to the eardrums can be caused by long-term exposure to loud noise. Because of this, the workers' hearing impaired is gradually low. These loud noises can also cause other problems which are tiredness, inattentiveness, dissatisfaction and anxious among workers (Parvin, 2020).

At the manufacturing building level, noise is generated from the rapid process, machines, tools, and others. Nevertheless, office employees from the manufacturing building are facing the same issue as well. The noise generated from the office environment is from the fax, photostat machine, and meeting/discussion. From the repetitive noise generation that causes health issues to the employee until it leads to permanent disability. The noise has a significant impact on the sick building syndrome.

H₂: There is a significant relationship between noise pollution and sick building syndrome.

2.3.3 Relationship between Psychosocial and Sick Building Syndrome

Psychosocial factors refer to aspects of work design, work management, the overall work environment, and social elements inside a workplace that have the potential to cause bodily and psychological harm, separate from their impact on organizational performance. The psychosocial work environment has the potential to impact both the psychological and physical well-being of an individual. Furthermore, an unfavorable working environment significantly undermines employees' performance and impacts the productivity of the organization. Workers impacted by

the risk factors exhibit notable alterations, including subpar social work conduct, weariness, and even diminished job productivity. The presence of a substandard psychosocial work environment is linked to increased rates of absenteeism and a decline in clinical conditions. Work performance, on the other hand, is evaluated based on the individual's competence and proficiency in carrying out job tasks. Conversely, the subpar work performance of employees, untrustworthy decision-making, and compromised judgement result in accidents, missed deadlines, and escalated expenses inside the organization. Therefore, it can serve as an indicator of problems and challenges that may arise in the workplace, encompassing various areas of employment such as inadequate compensation, social isolation, or excessive workload. The workers' job is anticipated to fulfil the company's requirements. Human labor remains essential in manufacturing plants, as even the most sophisticated machines require human supervision throughout the entire process. Another psychological danger in industrial plants is the prolonged and strenuous working hours, which can lead to emotional exhaustion among workers. Psychosocial risks, being intangible in nature, have the potential to significantly impact the mental well-being of exposed workers, leading to various adversities (MI, 2020).

According to Omair, (2019) acknowledged that violent behaviors at work and stress are significant barriers to occupational health and safety. The majority of job injuries result from physical stress and the excessive strain associated with prolonged repetitive tasks leading to injury in the joints, muscles, and tendons. Job stress is the experience of adverse physical and emotional responses when job demands surpass the worker's capabilities. It is well recognized as a significant obstacle for individuals in terms of their emotional and physical well-being, and it also negatively impacts the overall health of organizations. Workplace instability and physical strain also contribute to stress. Workers experiencing high levels of stress are more prone to poor health, less

motivation, reduced productivity, and a less secure working environment. Job strain, a significant cause of stress, is experienced by employees in the workplace. Even in companies that heavily rely on technology, the physical demands of work remain significant, leading to a high prevalence of physical hazards and job-related injuries. Stress and strain are main psychosocial factor. It is the initial stage of psychosocial factors at the workplace.

Nevertheless, it is important to highlight that most other occupational diseases, such as those caused by physical, chemical, and biological agents, as well as various building environmental factors, remain a top concern in Malaysian industry. Bakker, (2021) admitted job demands refer to the physical, social, or organizational elements of a role that necessitate prolonged physical or mental exertion and are linked to certain physiological and psychological expenses. Instances of job demands encompass elevated work pressure and emotionally taxing circumstances. Tummers, (2021) said that job resources refer to the tangible, social, or structural elements of a job that can serve the following purposes: facilitate the accomplishment of work objectives, alleviate job-related stress and its accompanying physical and mental toll, and foster personal advancement and progress. Stress is a detrimental combination of physical and emotional effects that arises from an imbalance between perceived demands and available resources, and an individual's ability to cope with those demands. While stress is not classified as a disease, it serves as an initial indicator of underlying issues. Work-related stress can exacerbate various health problems, including sleep disturbances, memory impairment, diabetes, obesity, peptic ulcers, inflammatory bowel diseases, musculoskeletal disorders, and high blood pressure. These conditions, in turn, increase the risk of developing heart disease, cardiovascular issues, and cancer (Javaid, 2018).

A study conducted by Erwandi, (2021) workers view psychological hazards in the workplace as having substantial potential risks. Certain psychological hazards have the potential

to significantly disrupt work habits and negatively impact on the health of workers. Workers perceive their work environment as a psychosocial risk when they are assigned to a job that does not align with their knowledge and skills (WHO, 2010). This will result in the manifestation of risky behaviors that could potentially result in work-related mishaps. Various research has demonstrated a correlation between psychosocial hazards and higher incidence of work-related accidents and absenteeism. Strain or stress act as intermediaries in the impact of psychosocial risks on the health and work behavior of workers. Put simply, psychological dangers in the workplace will directly affect workers during their task. Consequently, each psychological hazard encountered in the workplace imposes stress on the employee. This state of tension is sometimes referred to as stress or psychological danger. Perceiving psychosocial risk as unsettling while working can activate risk behaviors in workers. These occupational risk behaviors can result in work-related accidents.

Furthermore, Bac (2021) said in their study that psychosocial dangers can arise because of occupational stress. Job demands refer to the physical, social, or organizational elements of a role that necessitate prolonged physical or mental exertion and are linked to certain physiological and psychological expenses. These factors, through perceptions and experience, have the potential to influence health, work performance, and job satisfaction. Psychosocial stress arises when an employee is unable to handle working demands that surpass their coping abilities. The negative consequences that can be enumerated include subpar performance, a rise in absenteeism or employees reporting to work when ill, and an escalation in the occurrence of accidents and injuries. Work absenteeism resulting from stress typically has a longer duration compared to absences induced by other factors. A study conducted by the European Agency for Safety and Health, 2009 at work reveals that, on average, 51% of employees perceive work-related stress as a prevalent

issue in the workplace. Among microenterprises employing less than 10 individuals, 51% of workers perceive work-related stress as prevalent. In contrast, in larger organizations, this figure jumps to 60% of employees. The primary factors contributing to work-related stress include job reorganization, job instability, and excessive workload or long working hours.

Adding to this, Mokarami, (2020) said that insomnia and sleep disorders are common among industrial workers. Insomnia adversely impacts the efficiency and productivity of an organization. Employees who have these diseases have a much higher probability of being absent from work. Individuals experiencing sleep disruptions in professional settings exhibit less self-assurance and diminished levels of job contentment. Various risk factors present in occupational situations might adversely impact employees' sleep, leading to future health issues. Psychosocial factors are widely recognized as significant work-related risk factors that have been extensively studied for their contribution to these disturbances. These risk factors have the potential to diminish sleep stages, particularly stages 3 and 4, and to curtail and disrupt sleep. Psychosocial factors such as an imbalance between effort and reward, overcommitment, low job control, role conflict and ambiguity, high job demands, poor interpersonal relationships, job insecurity, lack of social support, and exposure to threats and violence at work significantly contribute to work-related sleep disturbances.

Psychosocial issues can be classified into three categories which is 'Job Control', 'Job Demand', and 'Social Support'. These three categories give satisfaction to an employee. The psychosocial issue can be impacted by direct or indirect labor of the organization. In some situations, employees are not aware on the psychosocial factors. Psychosocial factors can lead to health issues. 70% of Malaysian employees are experiencing work-related stress. This leads to

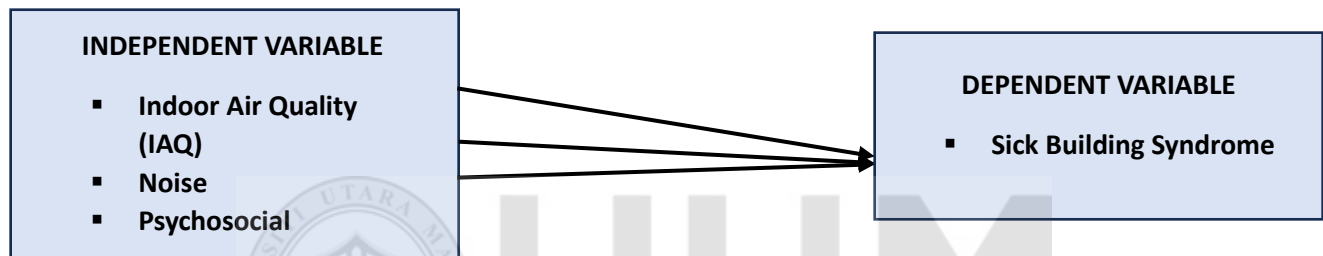
absenteeism and impact organization growth and business. Psychosocial has a significant relationship to sick building syndrome.

H₃: There is a significant relationship between psychosocial and sick building syndrome.

2.4 Research Framework

Figure 2.1

Research Framework



Based on Figure 2.1 is overall structure for a study which carries steps taken throughout the study. There are three independent variables for this study which is include indoor air quality (IAQ), noise and psychosocial. The dependent variable is sick building syndrome among manufacturing workers.

2.5 Hypothesis Development

The development of the hypotheses of the study were referred to the research questions and research objectives. There are four hypotheses developed.

H₁: There is a significant relationship between indoor air quality (IAQ) and sick building syndrome.

H₂: There is a significant relationship between noise pollution and sick building syndrome.

H₃: There is a significant relationship between psychosocial and sick building syndrome.

H₄: There is a significant influence of indoor air quality, noise pollution and psychosocial towards sick building syndrome.

2.6 Underpinning Theory

A.Hedge, (1987) Model

This model identifies three categories of determinants as possible precursors of SBS. Personal considerations, including age and gender; organizational factors, such as the nature of the organization, job categorization, and usage of video display terminals; and architectural aspects, encompassing the ventilation system, biological factor, chemical exposure, office design office orientation (impacting sunlight exposure), and the extent of personal environmental control, were posited as determinants of symptom reports. Personal environmental control, albeit sometimes lacking in offices, was regarded as potentially significant. Research on stressors, including noise, indicates that perceived control markedly diminishes negative behavioral consequences, but a deficiency of control over stressors like noise leads to heightened reporting of physical symptoms. Recent psychophysiological studies indicate that the lack of personal control over work demands adversely impacts hormonal stress responses. The extent to which employees may regulate their ambient environmental circumstances is likely to affect the degrees of distress encountered in the workplace. Moreover, it was posited that both individual and organizational factors could influence occupational stress levels, and that employees experiencing stress might report an increased incidence of SBS symptoms. Similarly, it was posited that individual and environmental factors influence workers' perceptions of the ambient environment, with the expectation that symptoms of Sick Building Syndrome (SBS) may be more common when workers find environmental conditions to be uncomfortable and inadequate.

Sir Karl Popper (1972) Theory

According to Popper, posits that reality comprises three distinct worlds, with all existence categorized inside one of these realms. World 1 comprises physical entities and conditions that adhere to the principles of physics and chemistry, encompassing matter, energy, and the physical structures of living organisms. At this world, the impact of volatile organic compounds (VOCs) illustrates the intricacies of environmental influences. Outdoor air comprises minimal amounts of volatile organic compounds (VOCs). The repetitive noise from manufacturing design due to physical environment/ conditions applies in World 1. This phase represents the actual physical working environment.

World 2 encompasses states of consciousness, mental states, or behavioral inclinations to act. Psychology and psychiatry address the phenomena of World 2, including cognition, emotions, and memory. World 3 encompasses the realm of objective knowledge, comprising elements such as language, arts, science, and cultural standards. In these worlds, the paradigm posits that occupational obligations or stressors induce a motivated state of "stress" in the individual. If no action can be taken, or if the individual's other objectives must be sacrificed due to limited decision latitude, the unresolved stress may result in detrimental psychological and physiological effects. This describes job control; job demands and social support at the working environment. In short, all the world leads to SBS symptoms and causes that affects workers well-being at workplace.

JD – R Theory

The theory delineates that job demands pertain to physical, social, or organizational elements of a job that necessitate continuous effort and are linked to physiological and psychological expenditures. The model highlights that burnout and work engagement buffer the relationship

between job demands and health issues, as well as between job resources and turnover intention. Examples of job resources encompass feedback, job autonomy, and social support. Work engagement is a favorable psychological condition marked by vigor, dedication, and immersion. Burnout depletes mental resources, resulting in health issues. The primary effects of demands and resources on burnout suggest that job demands are associated with fatigue, while inadequate resources correspond with social support. Job resources, on the other hand, stimulate a fulfilling work-related state of mind through achieving work goals and satisfying basic needs. This emotional and motivational condition promotes favorable organizational results, including commitment and performance. Thus, engagement mediates the relationship between job resources and organizational outcomes. Instances of job resources include feedback, job autonomy, and social support. In short, the theory related to the SBS symptoms and causes that affects workers well-being at workplace due to psychosocial factors.

2.7 Conclusion

The description of the study's independent and dependent variables has been provided in this chapter. There are three independent variables for sick building syndrome dependent variable. On the other hand, past studies analysis is also discussed in this chapter. Indoor air quality, noise and psychosocial are factors that contributed to sick building syndrome among manufacturing workers and cause illness. The common illness causes by workers are mucous membrane, asthma symptoms, neurotoxic and gastrointestinal symptoms. The research framework and the hypotheses that were investigated in the study have also been outlined in this chapter.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter outlines the research methods employed for this study. The study also addresses the research design, sampling methodologies, and operational definitions. The measurement of variables and instruments, data collection techniques, data analysis techniques, and conclusions are also highlighted in this chapter.

3.2 Research Design

A research design serves as a guide for gathering, evaluating, and analyzing data in accordance with the research questions (Sekaran, 2013). To find out if the chosen variables are related to the problem statement, this study used correlational analysis. In order to apply statistics and improve the quality of the findings drawn from the data, this study has employed quantitative statements to ascertain the quantity or extent of the phenomenon under investigation. (Sekaran, 2013).

Moreover, this research was conducted based on hypothesis testing, primary data collection has been used self-administered questionnaires. The variables that were tested including indoor air quality (IAQ), noise and psychosocial as independent variables and their impact from sick building syndrome as dependent variables among manufacturing workers were tested. This study analysis on the individual, which is workers from the operation department. For example, operators, technicians, engineers, general workers and so on. The individual analysis's purpose is to analyze and understand the influence of sick building syndrome from people to people. It is a

cross-sectional study that uses questionnaire distribution to gather data at one moment in time. Through the analysis of the study's variables, the data was gathered from the intended audience.

3.3 Population and Sampling

3.3.1 Study Population

According to Cresswell (2005) and Zikmund (2003), a population is a collection of people who have a common trait and is the entire category of a matter where the attention is on a certain research subject. The research targeted employees in the operations sector, specifically the production workers. The total population of workers from the operation department was 120 workers.

3.3.2 Sample Size

The researcher then establishes the sample size based on the study population. A subset of the population is referred to as a sample. The sample size comprises chosen individuals from the overall population. The sample size has been determined 92 respondents using Raosoft calculator and 120 questionnaires were distribution (Refer Appendix A). From the distribution, able to get 102 of respondents which was addressed as oversampling exceeding the minimum sample size. Sample size 102 of respondents used for the analysis.

3.3.3 Sampling Technique

Sampling techniques refer to the element of population and sample size. Sample size is a crucial feature in performing a study. To accurately represent the population's interests, appropriate sampling methodologies and sizes are essential for the researcher to draw valid conclusions. Random sampling techniques were applied to this study.

3.4 Operation Definitions and Measurements

Table 3.1

Operation Definitions and Measurements

VARIABLE	OPEARTIONAL DEFINITION	NUMBEROF ITEMS	ITEMS ADOPTED FROM
Sick Building Syndrome	Sick Building Syndrome (SBS) consists of a collection of mucosal, and general symptoms that are temporally associated with occupancy in specific buildings. (Burge,2004)	10 items	Raw,1996 (Refer Appendix B)
Indoor Air Quality (IAQ)	Indoor Air Quality (IAQ) refers to the air quality within and surrounding buildings and structures, particularly concerning the health and comfort of occupants. (US EPA, 2024)	20 items	Romaizi, 2017 (Refer Appendix B)
Noise Pollution	Noise pollution is an unwanted excessive sound that can have deleterious effects to human health from building environment. ((Nathanson & Berg, 2024)	9 items	Organization's Noise Risk Assessment, (2020) (Refer Appendix B)
Psychosocial	Psychosocial is influence by psychological factors and surrounded building conditions impact on physical and mental wellness. (Lu, 2017)	31 items	Karasek, 1998 (Refer Appendix B)

3.5 Layout of Questionnaire

The primary instrument for gathering data for this study is the questionnaire. To gather the information required from respondents, a closed-ended questionnaire was developed. Section A includes sociodemographic information; Section B includes sick building syndrome; Section C includes indoor air quality; Section D includes noise pollution; and Section E includes psychosocial information. All survey questions have been written in both English and Malay to improve the respondent's comprehension when completing the questions. Back-to-back translation was done before the questionnaire was distributed. (Refer Appendix B)

Section A was named “Socio-demographic information” where the personal details of respondents were collected by numerous questions. There were 7 questions stated in this section, which are job position, gender, age, nationality, academic qualifications, service period of the organization, and working department. This personal information is required to analyze the data in the next chapter after identification of the variable’s contribution at the organization.

Section B was named “Sick Building Syndrome” where the symptoms of SBS and control of the building environment stated in this section. There are 10 questions stated on types of symptoms and control of environment, which is air, lighting, temperature, privacy, smoking habit and office layout/decoration were questioned in this section. In this section, four-point Likert scale from ranging 1 none to 4 strongly agree have been used. Dichotomous scale, which is Yes or No options and frequency scale used in this section too. These questions aid in comprehending the building environment.

Section C was named “Indoor Air Quality” where the source of air ventilation, heat and temperature are from the building environment. There are 20 questions in this section, five-point

Likert scale from ranging 1 strongly disagree to 5 strongly agree has been used. A frequency scale was used in the study to identify the usage of equipment on a weekly basis. These questions aid in comprehending the building air quality.

Furthermore, the section D was named “Noise Pollution” where the source of noise from the building environment. There are 9 questions stated in this section about the noise from the equipment, personal protective equipment usage, awareness of the noise level and so on. Five-point Likert scale from ranging 1 strongly disagree to 5 strongly agree has been used. These questions aid in comprehending the noise pollution from the building.

The last part of the questionnaire is “Psychosocial” for section E. There are 31 questions consists of job control, job demand and social support of the psychosocial from the building environment. Five-point Likert scale from ranging 1 strongly disagree to 5 strongly agree has been used. These questions aid in comprehending the psychosocial effects from the building environment. In summary, there are 77 questions stated in this questionnaire form which could drive to analyze the data and evaluate the variables in next chapter.

3.6 Data Collection Procedure

Self-administered questionnaires were distributed to all employees by using an online platform survey form. For the foreign workers, they were given a session for answering the questionnaires in the presence of researchers. Each participant was given two weeks to finish the survey and was told that any information they submitted would be kept completely private and used only for the study. They did not have to fill out the form with their names in order to identify themselves. The researcher appointed several representatives for follow up the remaining questionnaire that not returning on time.

3.6.1 Pre-test

Before the research instrument was used in the actual study, a pre-test was carried out to assess its efficacy. It comprises testing research methods, like questionnaire, survey or interviews on a sample size of the population that was examined. In the pre-test, any flaws with the research instruments such as unclear questions, or problems with the survey format were found, and appropriate adjustment was made before the full-scale study begins. For the pre-test study, a questionnaire was distributed using an online platform survey form to academic experts and practitioners. 2 respondents are academic experts, and 1 respondent is the practitioner were used as pre-test survey respondents.

3.6.2 Pilot Study

Pilot study was conducted to forecast the actual survey; thus, the researcher able to assess the level of toughness in answering the questionnaires (Moore, 1991). Pilot study was conducted before the questionnaires being distributed to the 30 respondents from non-operation department employees. Based on the pilot test, 30 respondents filled out the questionnaire without any comments, which means that the questionnaire is easy to fill out due to the Brisline method. Moreover, the questionnaire was ready to be distributed to actual study population and collect data for analysis. The Cronbach Alpha value for SBS is 0.448, IAQ is 0.453, noise pollution is 0.900 and psychosocial is 0.767. It describes that, questions from SBS and IAQ slightly needs clarity in questions to ease respondents to answer whereas noise pollution and psychosocial above 0.6 value which means more clarity questions is included in these sections.

3.6.3 Actual Data Collection

Initially, get the survey approval form from the faculty. Followed by that, get approval from the Human Resources of the organization to proceed with data collection process. Before actual data collection, pre-test and pilot test were conducted to non-operation department employees by distribution of online platform survey form to ensure instrument is valid for actual study. After analyzing the pre-test and pilot test data, questionnaire distributed to employees personally and appointed representatives to follow up on the completion of the survey within two weeks of period. The data obtained from the survey questionnaire was compiled and analyzed. concentrated on the important details and data analysis in order to draw a conclusion from the data's output. Several data analysis techniques that being in this study include descriptive analysis, correlation analysis and regression analysis.

3.7 Data Analysis Strategy

Random sampling ensures that the collected data accurately represents the population. Nonetheless, employing random sampling may result in data that is not regularly distributed. Normality tests are employed to evaluate the conformity of the data to a normal distribution. It is crucial because statistical procedures presume that data adheres to a normal distribution, particularly when employing inferential techniques such as hypothesis testing, t-tests, or regression analysis.

3.7.1 Descriptive Analysis

The process of converting unprocessed data into a format that can be used to explain a group of variables in a situation is known as descriptive statistics. Frequencies, measures of central tendency (mean, median, mode), and measures of dispersion (range, standard deviation, and variance) are all part of descriptive statistics.

3.7.2 Correlation Analysis

Correlation measures the relationship between variables. The correlation has a range of -1.00 to +1.00 and is represented by the symbol r . A perfect positive correlation is represented by a value of +1.00, whereas a perfect negative correlation is represented by a number of -1.00. The value of 0.0 is referred to as lack of correlation. The likelihood that a relationship is statistically significant increases with the measure's proximity to 1.00.

3.7.3 Multiple Regression Analysis

A statistical method for determining the association between two or more variables is multiple regression (Rubinfeld, 2000). Multiple regression analysis has been utilized to determine which variables have a stronger or weaker association with musculoskeletal illnesses. The variables do have a significant impact on the dependent variable if the test yields a significant result ($p < 0.05$).

3.8 Conclusion

The research framework has been discussed in this chapter. The formulation of hypotheses, research design, sample strategies, and operational definition have all been described to the researcher. Furthermore, the methods for measuring variables and instruments, gathering data, and analyzing that data have been described. The following chapter will cover the findings and outcomes of the data analysis.



CHAPTER 4

RESULTS

4.1 Introduction

The results and conclusions of the questionnaire that was gathered to assess the connection between indoor air quality noise, psychological factors, and sick building syndrome are descriptively analyzed in this chapter. The response rate, the normalcy test, the demographic background of the respondents, chi-square analysis, descriptive analysis, correlation analysis, regression analysis of variables, and hypothesis testing are all covered in this chapter.

4.2 Response Rate

Workers in operation department were given a total of 120 questionnaires. Nevertheless, only 102 questionnaires were turned in, which helps explain the current study's 85% response rate. The study's response rate is displayed in Table 4.1.

Table 4.1

Response Rate

Items	Total(n)	Percentage (%)
Distributed questionnaire	120	100
Submitted questionnaire	102	85
Non submitted questionnaire	18	15

4.3 Normality Analysis

Many inferential statistical techniques rely on the assumption that data is normal. It evaluates how closely the sample distribution resembles a normal distribution. A factor's rating usually distributes "above average," according to Veal (2005), with spread being the distribution of a variable's score throughout the measurement tool.

Two techniques for evaluating the predictability of data distribution are kurtosis and skewness. The distribution's symmetry is indicated by the skewness value, while its "peakness" is reflected by the kurtosis value (Pallant, 2011). A distribution that is positively skewed is one in which the majority of the data has high values, which then taper off to the right. When there are many small values, the distribution is negatively skewed, with a tail on the left (Hair, Black, Babin, Anderson, and Tatham, 2006). A positive Kurtosis value is indicated by a distribution that is peaked or crowded in the center with long, thin tails. A standard level or an increase in dispersion is indicated by the kurtosis number (Pallant, 2011). In addition, Khine (2013) points out that in order to avoid going against the presumptions of parametric statistical analysis, the skewness value and kurtosis value should not be greater than 3 and 20, respectively. Additionally, the descriptive statistical analysis offered insightful information for analyzing the data. Metrics like mean and standard deviation can be used to evaluate the regularity of information transmission and conduct a thorough analysis of the data. The results of normalcy statistics are displayed in Table 4.2.

While Coakes, Steed, and Price (2005) state that kurtosis values between -3 and 3 are adequate for social science research, Sekaran (2003) states that skewness and kurtosis values between -2 and 2 are considered sufficient. According to Byrne (2013), a normal distribution is indicated by a kurtosis value of 3, but a deviation from normalcy is shown by a value of 5. All data

points fall within the designated range as a consequence of the descriptive statistical findings pertaining to the normalcy assumption, as shown in Table 4.2.

Besides, the mean of the dependent variable, Sick Building Syndrome, was 20.4706, whereas the mean values for the three independent variables—Indoor Air Quality, Noise Pollution, and Psychosocial—were 49.7549, 26.2745, and 96.5588, respectively. The skewness statistic for all variables ranged from -0.188 to 0.380, but the kurtosis statistic ranged from -0.644 to 2.676. In summary, all factors exhibited normality values close to 1.0, signifying that the data for all factors were normally distributed, hence allowing for the continuation to inferential statistics. Each standard deviation is below the mean, indicating sufficient data gathering.

Table 4.2
Normality Statistics

	N	Mean	Std. Dev.	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
DV_SBS	102	20.4706	3.90406	-0.188	0.239	-0.072	0.474
IVi_IAQ	102	49.7549	7.13579	0.102	0.239	-0.644	0.474
IVii_NP	102	26.2745	5.41753	0.221	0.239	2.676	0.474
IViii_P	102	96.5588	17.04251	0.380	0.239	-0.548	0.474

Figure 4.2.1

Histogram Normality Test Sick Building Syndrome

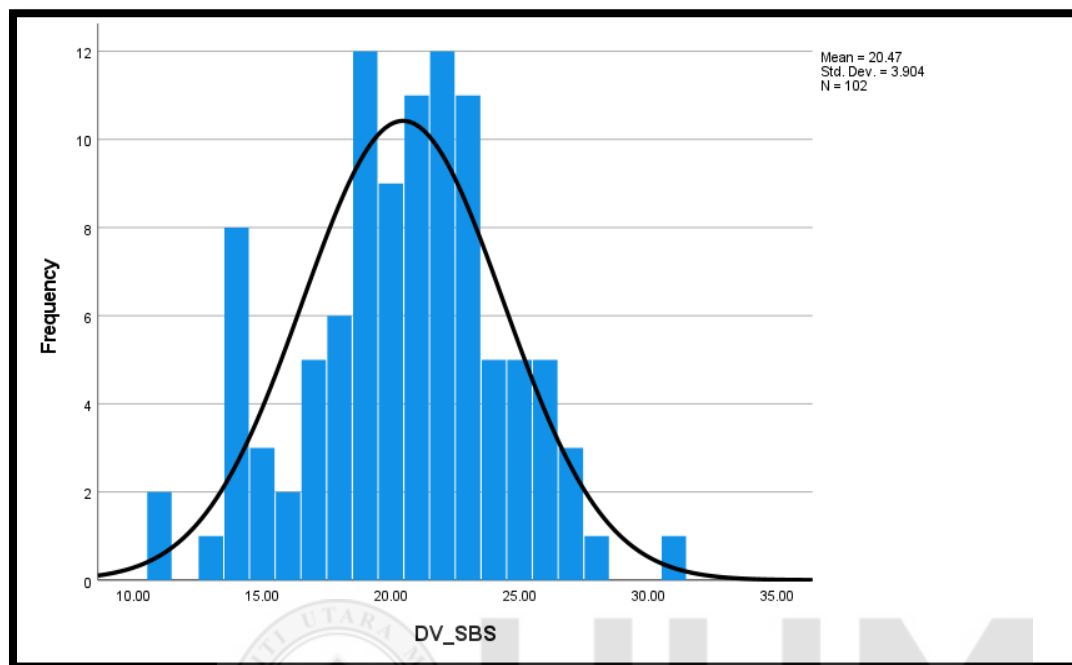


Figure 4.2.2

Histogram Normality Test Indoor Air Quality

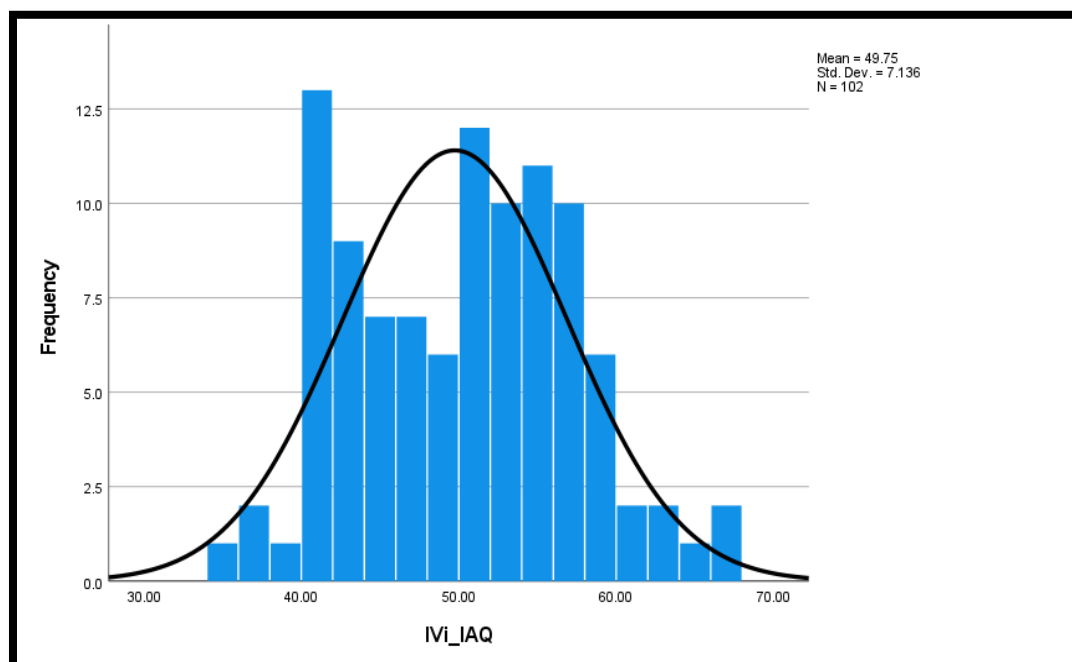


Figure 4.2.3

Histogram Normality Test Noise Pollution

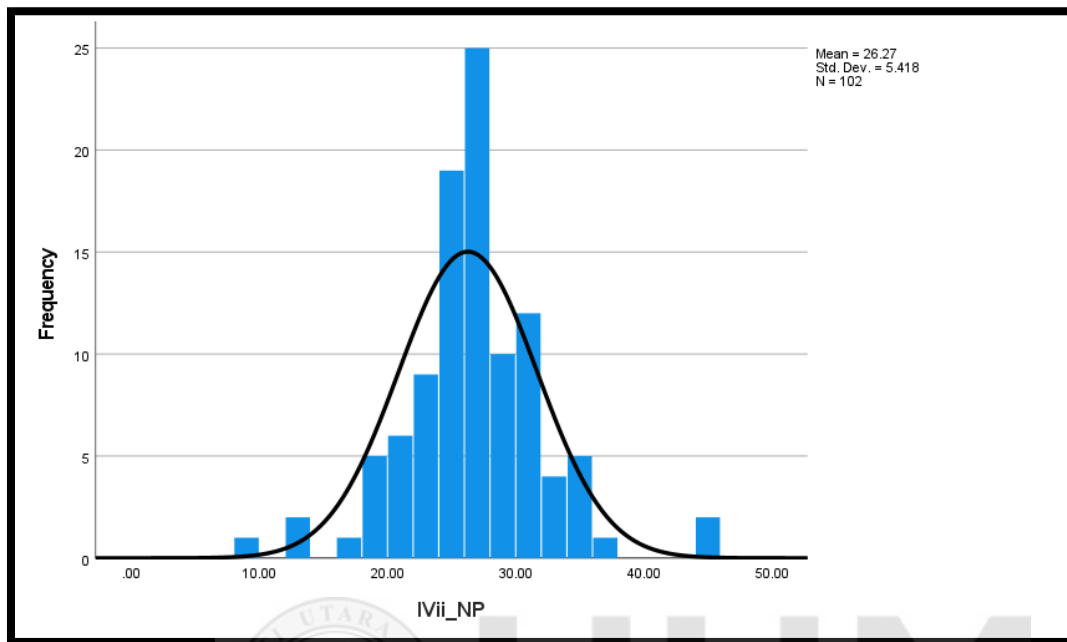
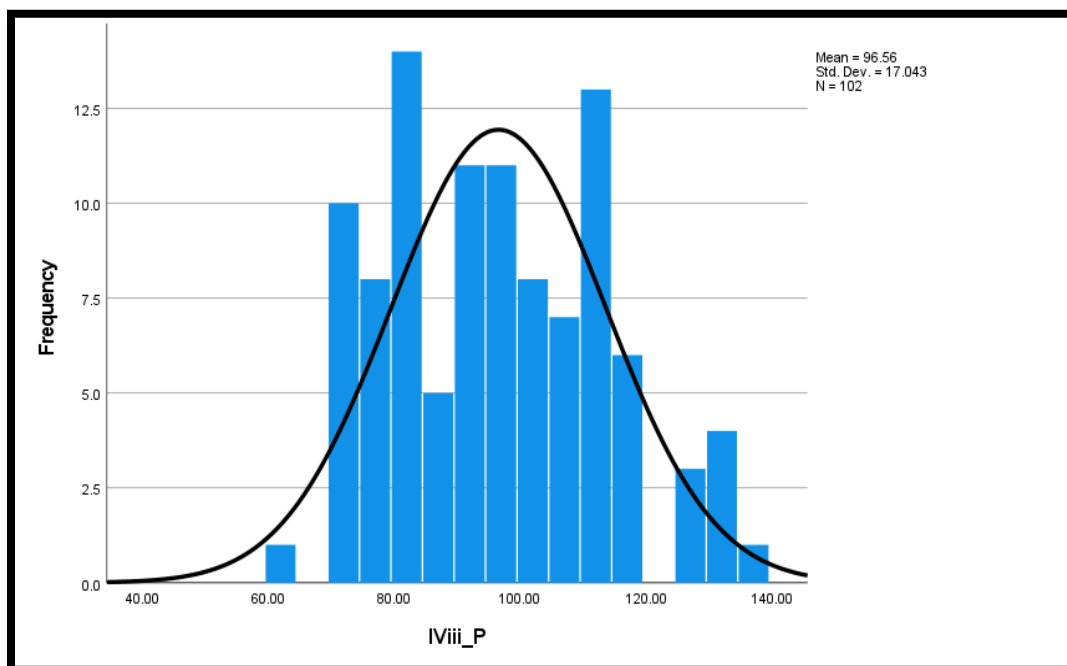


Figure 4.2.4

Histogram Normality Test Psychosocial



4.4 Descriptive Frequency Test

4.4.1 Respondent's Demographic Background

The demographic profile of the participating respondents is covered in this section. Before presenting the results, the demographics of the participants must be determined in order to rule out any factors that could compromise the study's validity. Job position, gender, age, nationality, educational background, work experience, and department are among the demographic details of the respondents for this study. Nominal and ordinal measures were used to measure the demographic respondents. The demographic characteristics of the respondents for this study are displayed in Table 4.3.

Based on the questionnaire result, a descriptive frequency test was used to observe the frequency and percentage of the respondent's demography. There are 102 responders in all to this study. In job position, general workers were the least respondents, responding by 3 of frequency (2.9%), followed by supervisors, responded by 4 of frequency (3.9%), technicians responded by 19 of frequency (18.6%), other workers, who are planners, production clerks, tool crib teams, logistics responded by 21 of frequency (20.6%), engineers responded by 22 of frequency (21.6%), meanwhile operators were the highest respondents, responding by 33 of frequency (32.4%).

Based on the gender result, female workers (61.8%), which is more than half of the respondents, seem to be more than male workers (38.2%) by a different 24 of frequency. Based on the age result, the respondents are varied in age. The youngest respondents, who are below 25 years old, respond with the highest frequency of 29 (28.4%), whereas the oldest respondents respond the least with frequency of 11 (10.8%), followed by the respondents in the age range of 25-30 years old (27.5%), 31-35 years old (21%), and 36-40 years old (12.7%).

The majority of respondents from Malaysian seems to be many respondents by 98 of frequency and 96.1% of percentage, followed by Bangladeshi (2%), Indonesian and Nepalese respond the least, with 1 of frequency (1%) respectively. The highest academic qualification among respondents was at degree level, with a frequency of 38 and 37.3%. Nearly half of the respondents spend 1 to 4 years of working period by 42 of frequency (41.2%), followed by in the range of less than 1 year by 25 of frequency (24.5%), in the range of 5-10 years by 20 of frequency (19.6%), and the least number of respondents spend their time for more than 10 years of working period by 15 of frequency (14.7%). There are slightly more than half of respondents, 52 of frequency (51%) from the assembly department, followed by the molding department, 26 of frequency (25.5%), and not much different in the other department, with 24 of frequency (23.5%). (Refer to Appendix C)

Table 4.3

Respondents Demographic Characteristics

Variables	Category	Frequency	Percent
Job Position	Supervisor	4	3.9%
	Engineer	22	21.6%
	Operator	33	32.4%
	Technician	19	18.6%
	General worker	3	2.9%
	Others	21	20.6%
Gender	Male	39	38.2%
	Female	63	61.8%
Age	Below 25 years	29	28.4%
	25 – 30 years	28	27.5%
	31 – 35 years	21	20.6%
	36 – 40 years	13	12.7%
	Above 40 years	11	10.8%
Nationality	Malaysian	98	96.1%
	Indonesian	1	1.0%
	Bangladeshi	2	2.0%

Table 4.3 (continue)

Variables	Category	Frequency	Percent
	Nepalese	1	1.0%
Academic Qualification	Primary school	4	3.9%
	SPM	24	23.5%
	Certificate	10	9.8%
	Diploma	22	21.6%
	Degree	38	37.3%
	Other	4	3.9%
Period of working	Less than 1 years	25	24.5%
	1 – 4 years	42	41.2%
	5 – 10 years	20	19.6%
	More than 10 years	15	14.7%
Working department	Molding	26	25.5%
	Assembly	52	51.0%
	others	24	23.5%

4.4.2 Frequency of Indicate Working Near Computer, Photocopy and Fax Machine

The first question from the Indoor Air Quality section that contains 3 items below used nominal measurements, which are every day, 2 to 3 times a week and never. Descriptive frequency was used to see the frequency and percentage result of respondents, as nominal measurement cannot be computed together with other items on the same section that used scale measurement. Based on table 4.3.2, the majority of respondents work near a computer every day, with frequency of 85 (83.3%), never work near a photocopy machine, with a frequency of 57 (55.9%) also never work near a fax machine, with a frequency of 88 (86.3%). Least of respondents never work near to computer by 5 of frequency and (4.9%), 2 to 3 times a week working near to photocopy machine by 17 of frequency and (16.7%), also 2 to 3 times a week working near a fax machine by 5 of frequency and (4.9%). As the result, a high number of workers are working near computers however, the least number of workers are working near fax machines. Table 4.4 shows the

frequency of indicating respondent working near computer, photocopy machine and fax machine.
(Refer to Appendix E)

Table 4.4

Frequency of Indicate Respondent Working Near Computer, Photocopy and Fax Machine

Variables	Category	Frequency	Percent
Indicate of working near computer	Everyday	85	83.3%
	2 – 3 times a week	12	11.8%
	Never	5	4.9%
Indicate of working near photocopy machine	Everyday	28	27.5%
	2 – 3 times a week	17	16.7%
	Never	57	55.9%
Indicate of working near fax machine	Everyday	9	8.8%
	2 – 3 times a week	5	4.9%
	Never	88	86.3%

4.4.3 Frequency of Smoking Respondents and Frequency of Cigarettes Taken during Working Hours

There are 17 respondents smoking, whereas 85 respondents are not smoking. 6.9% of respondents smoke 3 cigarettes throughout the working hours. Table 4.4 shows the frequency of smoking respondents and frequency of cigarettes taken during working hours.

Table 4.5

Frequency of Smoking Respondents and Frequency of Cigarettes Taken During Working Hours

Variables	Category	Frequency	Percent
Do you smoke	Yes	17	16.7%
	No	85	83.3%
If YES, please specify how many cigarettes taken during working hours	2 cigarettes	2	2.0%
	3 cigarettes	7	6.9%
	4 cigarettes	4	3.9%
	5 cigarettes	2	2.0%
	8 cigarettes	1	1.0%
	10 cigarettes	1	1.0%

4.5 Chi Square Analysis

The first and second questions in the Sick Building Syndrome section were measured using a nominal scale. Dryness of eyes, itchy and watery eyes, blocked nose and runny nose for the first question; meanwhile every day, 2 to 3 days a week, 1 to 2 days a week, every 2 to 3 weeks, and less often for the second question. The chi-square test was used to observe the comparison between those 2 items, as nominal measurement cannot be computed together with other items on the same section that used scale measurement. Based on Table 4.5, a positive and significant comparison between sickness in the past 12 months and the frequency of the sickness can be observed. Table 4.5 shows the comparison between sickness respondents had in past 12 months that more than twice and frequency of the symptom. (Refer to Appendix F)

Table 4.6

Comparison between Sickness Respondents had in Past 12 months that More than Twice and Frequency of the Symptom

Sickness in past 12 months respondent had more than twice	Frequency of symptom					
	Everyday	2 – 3 days each week	1 – 2 days each week	Every 2 – 3 weeks	Less often	Total
Dryness of eyes	0	1	0	4	6	11
Itchy and watery of eyes	0	1	2	8	2	13
Blocked nose	1	0	4	9	6	20
Runny nose	2	0	3	9	44	58
Total	3	2	9	30	58	102
df	12					
X ²	33.283					
Critical value	21.026					
Phi Cramer's	0.330					
P	0.000					

H₁: There is a comparison between sickness in past 12 months and frequency of the sickness.

The X^2 value calculated at 33.283 is bigger than the critical value which is at 21.026. These values meaning that X^2 is outside the acceptance area, replaced by H₁. This means there is a comparison of those variables. Statistical results show that there is a comparison between sickness in the past 12 months and the frequency of the sickness. Phi Cramer's value is at 0.330, which means comparison between sickness in the past 12 months and the frequency of the sickness that is positive and significant ($p = 0.000$).



4.6 Descriptive Analysis

Descriptive analysis in this study was performed to determine the mean and standard deviation, which represent the attributes of the variables. The mean value's purpose is to calculate the data set's average (Meier, 2002). Data dispersion around the mean is measured by the standard deviation. The dependent variable, sick building syndrome, was examined after the independent variables, indoor air quality, noise pollution, and psychological, were tested. The actual mean came out excluding items that used nominal measurement such as the first question (3 items) on section Indoor Air Quality and the first and second questions of section Sick Building Syndrome. All of the items that only used nominal scale measurement were included in the actual mean using descriptive analysis.

Both a 4-point and a 5-point Likert scale were used to measure the mean value of the variables. A 4-point Likert scale, with 1 denoting "None," 2 "Minimum control," 3 "Control," and 4 "Maximum control," was used to measure the dependent variable (SBS). Conversely, a 5-point Likert scale, with 1 denoting "Strongly disagree," 2 "Disagree," 3 "Neither disagree nor agree," 4 "Agree," and 5 "Strongly Agree," was used to quantify the independent variables (IAQ, noise, and psychosocial).

The mean and standard deviation for the independent and dependent variables are displayed in Table 4.6. The mean (M) and standard deviation (SD) values for the independent variables—indoor air quality (M=49.7549, SD=7.13579), noise pollution (M=26.2745, SD=5.41753), and psychosocial (M=96.5589, SD=17.04251)—were displayed in the first three findings. On the other hand, sick building syndrome's mean and standard deviation are M=20.4706 and SD=3.90406.

According to the results, the psychosocial mean value was the highest at 96.5588, while the SBS mean value was the lowest at 20.4706. In addition, the psychosocial standard deviation

number is 17.04251, whereas the SBS standard deviation value is 3.90406. Besides that, the highest standard deviation value is 17.04251 for psychosocial and the lowest standard deviation value is 3.90406 for SBS. As a summary, the result shows that all the sections were at a simple level. Table 4.6 shows descriptive analysis for this study. (Refer to Appendix G)

Table 4.7 Descriptive Analysis

Section	Mean	Std Deviation	Level
Sick Building Syndrome	20.4706	3.90406	Low Simple High
Indoor Air Quality	49.7549	7.13579	Low Simple High
Noise Pollution	26.2745	5.41753	Low Simple High
Psychosocial	96.5588	17.04251	Low Simple High

4.7 Hypothesis Testing

4.7.1 Pearson's Correlation Analysis

The Pearson Correlation is the degree to which one variable is linearly related to another is described by the coefficient analysis, which measures the strength and direction of the linear relationship between four variables.

a) Hypothesis 1

H₁: There is a significant relationship between indoor air quality (IAQ) and sick building syndrome (SBS)

Hypothesis 1 has been tested using Pearson correlation. The result of correlation analysis between indoor air quality and sick building syndrome showed significance as the p-value was 0.000 that is smaller than the significant value 0.01 ($p\text{-value} = 0.000 \leq 0.01$). There was a negative relationship between indoor air quality and sick building syndrome with $r = -0.393$ significantly. As the summary, there are a negative and significantly correlation between indoor air quality and sick building syndrome as higher indoor air quality correlated to lower sick building syndrome, lower indoor air quality correlated to higher sick building syndrome. The relationship of the hypothesis is accepted.

b) Hypothesis 2

H₂: There is a significant relationship between noise pollution and sick building syndrome (SBS)

Hypothesis 2 has been tested using Pearson correlation. The result of correlation analysis between noise pollution and sick building syndrome showed significance as the p-value was 0.000 that is smaller than the significant value 0.01 ($p\text{-value} = 0.000 \leq 0.01$). There was a positive relationship between noise pollution and sick building syndrome with $r = 0.143$ significantly. As the summary, there is a relationship between noise pollution and sick building syndrome. The relationship of the hypothesis is accepted.

c) Hypothesis 3

H₃: There is a significant relationship between psychosocial and sick building syndrome (SBS)

Hypothesis 3 has been tested using Pearson correlation. The result of correlation analysis between psychosocial and sick building syndrome showed significance as the p-value was 0.000 that is smaller than the significant value 0.01 ($p\text{-value} = 0.000 \leq 0.01$). There was a negative relationship between psychosocial and sick building syndrome with $r = -0.426$ significantly. As the summary, there is a negative and significantly correlation between psychosocial and sick building syndrome as higher psychosocial correlated to lower sick building syndrome and lower psychosocial correlated to higher sick building syndrome. The relationship of the hypothesis is accepted.

Table 4.8 shows that two independent variables were negatively significantly related to the dependent variable sick building syndrome, which are indoor air quality and psychosocial; meanwhile, the independent variable noise pollution was not significantly related to the dependent variable. (Refer to Appendix H)

Table 4.8

Relationship between Indoor Air Quality, Noise Pollution and Psychosocial between Sick Building Syndrome

Correlations		
		Sick Building Syndrome (DV)
Indoor Air Quality	Pearson Correlation	-0.393**
	Sig. (2-tailed)	0.000
	N	102
Noise Pollution	Pearson Correlation	0.143**
	Sig. (2-tailed)	0.000
	N	102
Psychosocial	Pearson Correlation	-0.426**
	Sig. (2-tailed)	0.000
	N	102

*. Correlation is significant at the 0.05 level (2-tailed).
 **. Correlation is significant at the 0.01 level (2-tailed).

4.7.2 Regression Analysis

d) Hypothesis 4

H₄: There is a significant influence of indoor air quality, noise pollution and psychosocial towards sick building syndrome

Multiple regression analysis has been used for testing Hypothesis 4. Based on the table 4.9, the R value indicates a strong value ($R=0.445$). Besides that, the value of ($R^2 = 0.198$). So, the size of indoor air quality, noise pollution and psychosocial is affecting sick building syndrome by 19.8%. 19.8% is the variability in SBS can be attributed to the predictors (indoor air quality, noise pollution and psychosocial) which included in the model. The $R^2 = 19.8\%$ means that the predictors have a modest impact on explaining SBS, and there's still a significant portion of variability in SBS that remains unexplained by the model. 19.8% indicates low relationship between SBS and predictors meanwhile it is only a small portion of the variation in SBS is accounted by the predictors, other factors might also play a significant role in explaining the SBS behavior.

Table 4.9

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.445 ^a	.198	.173	3.54928	.198	8.067	3	98	.000
a. Predictors: (Constant), IViii_P, IVii_NP, IVi_IAQ									
b. Dependent Variable: DV_SBS									

Table 4.10 shows the model summary show the size of coefficient of determination to understand variability dependent variable to independent variable. On this case, sick building syndrome can

be explained using independent variable indoor air quality, noise pollution and psychosocial. Coefficient of Determination also used to calculate size of effect independent variable to dependent variable. Coefficient of Determination can be calculated by R square multiple by 100%. In this case R square is 0.198 multiple by 100% is 19.8%. So, the size of indoor air quality, noise pollution and psychosocial is affecting sick building syndrome by 19.8%. The rest of that (100% - 19.8% = 80.2%), 80.2% must be explained by another factor. (Refer to Appendix I)

Table 4.10 shows Coefficients describes the regression equation, which is $Y = a + bX_1 + bX_2 + bX_3$. The number 30.786 describes when bX_1 (indoor air quality), bX_2 (noise pollution), and bX_3 (psychosocial) are equal to zero. Every plus one (+1) sick building syndrome is equal to -0.097 indoor air quality, 0.035 noise pollution, and -0.067 psychosocial.

Table 4.10

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	30.786	3.163		9.732	0.000
IVi_IAQ	-0.097	.073	-0.174	-1.309	0.194
IVii_NP	0.035	.065	0.049	0.537	0.593
IViii_P	-0.067	.030	-0.294	-2.217	0.029
a. Dependent Variable: DV_SBS					

H₄: There is a significant influence of indoor air quality, noise pollution and psychosocial towards sick building syndrome

The t-value of indoor air quality is -1.309, and the significant value is 0.194. Because of p-value is above significant level, H₄ must be rejected for indoor air quality, which means indoor air quality is not affecting sick building syndrome significantly.

The t-value of noise pollution is 0.537, and noise pollution, the significant value is 0.593. Because of p-value above significant level, H₄ must be rejected for noise pollution, which means noise pollution is not affecting sick building syndrome significantly.

The t-value of psychosocial is -2.217, and the significant value is 0.029. Because of p-value below the significant level, H₄ must be accepted for psychosocial, meaning psychosocial is affecting sick building syndrome significantly.

Moreover, a higher beta value corresponds to a greater influence on the dependent variable. Indoor air quality achieved the beta value ($\beta = -0.175$), followed by noise pollution ($\beta = 0.049$) and psychosocial factors ($\beta = -0.294$). The findings of this study indicated that noise pollution is the most significant factor influencing sick building syndrome.

As the summary, the test result came out as indoor air quality is not affecting sick building syndrome which shows higher value of p-value and lower value of beta. The noise pollution is not affecting sick building syndrome which shows high p-value, however, has a most significant beta value. The psychosocial are positively affecting sick building syndrome, and moderate beta value stated. The regression equation is $Y (\text{sick building syndrome}) = 30.786 - 0.095 (\text{indoor air quality}) + 0.035 (\text{noise pollution}) - 0.067 (\text{psychosocial})$. Thus, the theory about this connection is accepted.

4.7.3 Summary of Hypothesis Testing

H₁: There is a relationship between Indoor Air Quality and Sick Building Syndrome

For the first hypothesis, correlation analysis is utilized to show that indoor air quality has a significant relationship with sick building syndrome with $r = -0.393$, $p < 0.01$, and significantly influences sick building syndrome as result of regression analysis that came out $\beta = -0.174$, $p > 0.01$.

H₂: There is a relationship between Noise Pollution and Sick Building Syndrome

For the second hypothesis, correlation analysis is utilized to inspect that noise pollution has a moderately significant relationship with sick building syndrome with $r = 0.143$, $p > 0.01$ and significantly influences sick building syndrome as a result of regression analysis that came out $\beta = 0.049$, $p < 0.01$.

H₃: There is a relationship between Psychosocial and Sick Building Syndrome

For the third hypothesis, correlation analysis is utilized to inspect that psychosocial has a significant relationship with sick building syndrome with $r = -0.426$, $p < 0.01$ and significantly influences sick building syndrome as a result of regression analysis that came out $\beta = -0.294$, $p < 0.01$. As a summary, Table 4.17 shows that the summary of hypothesis independent variables indoor air quality, noise pollution and psychosocial to sick building syndrome.

Table 4.11

Summary of Hypothesis Independent Variables Indoor Air Quality, Noise Pollution and Psychosocial to Sick Building Syndrome

Variable	Relationship	Influence
Indoor Air Quality	Significantly corelated	Not influencing
Noise Pollution	Significantly corelated	Not influencing
Psychosocial	Significantly corelated	Significantly Influencing

4.8 Conclusion

The results of the analysis of data collected via a distributed questionnaire have been explained in this chapter. This study produced three hypotheses, all of which were supported by the analysis. Response rate, normalcy analysis, respondents' demographic background, chi-square analysis, descriptive analysis, Pearson's correlation, and regression analysis were all included in the analysis. The investigation's conclusions also support the previously established, verified hypotheses. The following chapter will address the current study's debate, recommendation, and conclusion.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Introduction

The main conclusions drawn from the data analysis are covered in this chapter. By addressing the research objectives to confirm indoor air quality, noise pollution, and psychosocial aspects that contribute to ill building syndrome among manufacturing workers, the findings can be concluded. Theoretical and practical implications are being discussed. Additionally, the study's shortcomings, recommendations, and ideas for additional research are being considered. Finally, a conclusion marks the end of the chapter.

5.2 Recapitulation of the study

The purpose of this study is to look at the causes of sick building syndrome among manufacturing workers. A total of 120 questionnaires have been shared, but only 102 questionnaires were submitted online. Descriptive analysis has been used to examine the gathered questionnaire in order to determine the demographics of the participants. Regression analysis and Pearson's correlation were then performed to determine the link between the variables.

For the respondent's demographic background, the majority of respondents were working as operators with a total of 33. A high number of respondents were female, which is 63, while the male respondents were 39. Respondents with age below 25 years old showed the highest response with a total of 29. In addition, the majority of the survey respondents were Malaysian with a total of 98, and the majority of the respondents had degree certificates, with a total of 38. Most of the

respondents have been working with the current company for 1-4 years, and 52 workers are from the assembly department. Lastly, most respondents were not smoking with a total of 85.

For every variable, a correlation analysis was performed. The independent variables are displayed in the correlation analysis findings, such as indoor air quality, noise pollution, psychosocial have positive and negative associations with sick building syndrome. The strength of the correlation (r) is medium for indoor air quality, noise pollution, psychosocial to sick building syndrome.

Additionally, it was discovered that there was an absolute correlation between sick building syndrome and the beta (β) value for all independent factors. Hence, of the three independent variables, psychosocial factors can be concluded to have significant relationship on sick building syndrome.

5.3 Discussion of the Findings

Four objectives were established earlier in this study to investigate the factors influencing factory workers who suffer from sick building syndrome. Each objective is covered in more detail in the section that follows.

5.3.1 Indoor Air Quality (IAQ) and Sick Building Syndrome (SBS)

Based on the findings, there is a significant, moderately negative relationship between indoor air quality and sick building syndrome. The negative correlation illustrates that a good indoor air quality system led to reducing discomfort in the human body, which can reduce the prevalence of sick building syndrome. The beta value of indoor air quality is ($\beta = -0.175$) which indicates this variable influenced SBS. It is second highest beta variance of this study. The findings are similar to the previous study which mentioned by DOSH (2010), refers to the impact of indoor air on an

individual's health, comfort, and productivity. It may encompass temperature, humidity, mold, bacteria, inadequate ventilation, or contact with other substances.

Walder, (2023) said that air quality also affects thermal comfort. This includes factors such as ambient temperature, humidity, air velocity, and radiant heat. The correlation between sick building syndrome and thermal comfort is that inadequate indoor thermal conditions can elevate the SBS symptoms. Excessively high or low room temperature, inappropriate humidity levels, or powerful drafts can result in complications. The likelihood of experiencing sick building syndrome symptoms escalates when individuals occupy an environment characterized by inadequate thermal comfort. Based on the findings, many respondents reported heat radiation gives discomfort from visual display aids and windows, and temperature, relative humidity, and air flow rates are not checked regularly during working hours. Passarelli, (2009) stated that people react physically to an atmosphere that is either too hot or too cold. Employees who might be more vulnerable to extreme temperatures may be more affected by this reaction, which would further aggravate physical discomfort. In a building, dry, airless conditions are typical. This can cause coughing, sore throats, and, in certain situations, an elevated risk of dehydration, which can have detrimental consequences on the body and mind.

Moreover, the increase in interior air pollutants is partially caused by the separation of indoor spaces from the natural outdoor environment in tightly sealed buildings. Based on the findings, a high number of respondents expressed that air reaches all the areas at the workplace and sufficient air supply and extraction of air ventilation in every area. Air pollutants are also produced by contemporary office equipment such as copiers, fax machines, and laser printers. According to studies, residents are exposed to 100 times more indoor air pollutants than they are

to outside ones (Jafari, 2015). Based on the findings, usage of computers is high compared to photocopy machines and fax machines.

On the other hand, respondents highly noticed and reported accumulation of particles/dust around the air vents and outdoor air intake duct, significantly located near the cooling tower. The indoor air quality (IAQ) is influenced by outdoor air pollutants, including fine particulate matter, carbon monoxide (CO), and ozone (O₃). Carbon dioxide (CO₂) serves as a measure of a building's ventilation efficiency (Aziz, 2013). Individuals spend most of their time inside; the presence of indoor air pollution has a substantial influence on both human health and productivity in the workplace (Mannan, 2021). It is proven that ducts/particles at the ventilation produce particles.

Furthermore, indoor environmental parameters are influenced by the perceived comfort and hygienic standards of indoor physical, chemical, and biological substances (Juhasova, 2017). The increasing prevalence of chemical pollutants in consumer and commercial products, the trend toward more airtight building structures and reduced airflow for energy conservation, and the push to delay maintenance and other building services to cut expenses have contributed to indoor air quality (IAQ) issues in most of the buildings. Individual susceptibility to pollutants can vary significantly from person to person, resulting in different reactions to pollutants in some situations (Khullar, 2017). Based on the findings, respondents agreed that cleaning of the air conditioning system was not carried out as per schedule and found visible fungal growth and high usage of detergent, chemicals, and hazardous substances in the building. The nature of the manufacturing process contains chemicals as raw materials and hazardous substances/materials. These chemicals may emit volatile organic compounds (VOCs), such as formaldehyde. As per the finding results, almost 83% of respondents don't smoke; it shows smokers don't create VOC in the building. Environmental tobacco smoke emits elevated concentrations of volatile organic compounds,

various hazardous substances, and respirable particle matter (Mansor, 1991). It shows VOC emissions in the building due to the chemical substance's usage.

As a summary, poor indoor air quality can lead to various short- and long-term health problems, resulting in discomfort, absenteeism, adverse health effects in the workplace, and diminished employee productivity (Abu Mansor, 2024). As per the findings, most of the respondents reported experiencing running nose issues in the past 12 months, with symptoms ranging less often.

5.3.2 Noise Pollution and Sick Building Syndrome (SBS)

Based on the findings, there is a significant, moderately positive relationship between noise pollution and sick building syndrome. The positive correlation illustrates that noise pollution factors contribute to sick building syndrome among manufacturing workers. The beta value of indoor air quality is ($\beta = 0.049$) which indicates this variable greater influenced to SBS. The findings are similar to the previous study which Behar, (2021) says that noise in the workplace refers to all audible sounds, whether intentional or unintentional, and is a prevalent hazard present in various environment. Extended exposure to loud noise can cause permanent harm to a person's hearing and diminish their quality of life.

Alnabih, (2021) in their study, said that these annoyance reactions are linked to the extent, diversity, and intensity of daily activities. Aggressive industrial noise typically arises from the constant noise produced by machinery, noise caused by the flow of materials, rapid and repetitive movements, as well as the tools used in conjunction with generators and electro-mechanical devices in the work area. Based on the findings, a high number of respondents agreed that using noisy powered tools from the source of impact hammer/pneumatic tool or machinery at the

workplace. Molding, ultrasonic, assembly machines are highly used at the organizations. It is proven that the repetitive motions or process flow cause industrial noise, which workers hear throughout their working hours.

According to Occupational Safety and Health Administration (OSHA), 2020 standards, employers are obligated to calculate the maximum duration of noise exposure for employees, which should not exceed eight hours on average with a limit of 85 dBA. Prolonged exposure to a constant noise level ranging from 85 to 90 dBA might result in gradual hearing impairment and alterations in the threshold sensitivities. Based on the findings, a total of 63.7% of respondents agreed that they needed to communicate with someone about one meter away with a high raised voice and 74.6% of respondents reported they couldn't hear instructions clearly due to too much noise. The usage of machinery tools or equipment produces a high noise level, which leads difficulties for workers to communicate. Employees exposed to noise levels at or exceeding the NIOSH recommended exposure limit are at risk of experiencing substantial hearing damage during their careers (Noise and Hearing Loss, 2024).

Adding to that, hearing protections are essential to avert noise-induced hearing loss. Hearing protection devices diminish the acoustic energy that impacts and harms the inner ear. Earmuffs and earplugs represent the predominant forms of personal hearing protector (PHP) (PPE Hearing Protection, 2023). Based on the findings, 32.4% respondents stated that workers don't use personal hearing protector (PHP) for some work and 46.1% equipment doesn't consists of manufacturers sound information for example, peak sound level and sound pressure level. Signage emphasizing the necessity for hearing protection is displayed at all entrances to areas where noise levels consistently surpass the Occupational Exposure Limit (OEL) of 85 dB (*Noise Hazards*, 2022). This shows that workers not aware of industrial noise causing from building environment.

The impact of the noise on human health can be categorized into four groups: physiological effects (such as hypertension, cardiac arrhythmia, and ulcers), psychological effects (including stress and irritability), performance effects (resulting in decreased productivity), and physical effects (such as hearing loss) (Subramaniam, 2019). And then, excessive noise can diminish productivity, disrupt communication and focus, and increase the likelihood of workplace accidents and injuries by obscuring warning signals (Occupational Noise Exposure, 2023).

As a summary, noise pollution can be determined as moderator variable to sick building syndrome. Noise pollution has a positive relationship to sick building syndrome in correlation analysis anyhow noise pollution not significant in regression analysis. Noise pollution affects the relationship between SBS and IAQ, psychosocial which strengthens the variables. However, noise pollution positively correlated to SBS. For instance, the noise pollution could amplify the effects of poor air quality, inadequate lighting, or temperature fluctuations, or mitigate the relationship between SBS and IAQ. If noise levels are high in a building, they may increase stress and anxiety among workers. Studies have shown that chronic noise exposure can trigger physiological responses, which may individual's resilience to other environmental stressors within the building. Psychosocial factors refer to the psychological and social aspects of the environment which significantly affect individual's health and including symptoms of SBS. High stress due to demanding work, poor relationship with colleagues, lack of social support or poor interpersonal skills, job control over work environment causes SBS symptoms. When noise is high in a building, it may directly interact with psychosocial stressors. If employees are stressed due to a heavy workload or poor social support, the presence of noise pollution may further intensity the symptoms of SBS which creating a stronger connection between psychosocial and SBS. Noise pollution can moderate the relationship between building-related environmental factors and Sick

Building Syndrome symptoms by amplifying or diminishing the negative health effects caused by poor indoor conditions. This moderating role of noise pollution highlights the IAQ and psychosocial together when investigating SBS, as the presence of noise can significantly alter the degree of discomfort or illness individuals experience.

5.3.3 Psychosocial and Sick Building Syndrome (SBS)

Based on the findings, there is a significant, moderately negative relationship between psychosocial and sick building syndrome. The negative correlation illustrates that a good psychosocial system led to good mental well-being in the human body, which can reduce the prevalence of sick building syndrome. The beta value of indoor air quality is ($\beta = -0.294$) which indicates this variable influenced SBS. It is the lowest beta value of this study which is influenced low to SBS. The findings are similar to the previous study which Martikainen, (2002) mentioned that psychosocial pertains to the interactions among individuals with their cognition, actions, and societal surroundings. The phrase refers to the interaction between mental health, psychological elements, and the environment, and their impact on an individual. The term "psychological" pertains to aspects, emotions, and encounters associated with the human mind and mental well-being.

Psychosocial issues can be classified into three categories, which are 'Job Control', 'Job Demand', and 'Social Support'. Employees facing elevated workplace expectations, like excessive workloads, resource limitations, or time constraints, may feel overwhelmed or incapable of managing their responsibilities. Individuals facing minimal occupational demands, such as repetitive or tedious activities, may experience boredom, disengagement, or underutilization. Prolonged elevated or diminished employment demands are more likely to inflict psychological

and physical damage, especially when coupled with inadequate support and/or additional psychosocial hazards (Job Demands, 2024). Based on the job demand findings, 77.5% of respondents reported working under extensive work pressure. Work pressure is caused by too many job tasks, feeling job task difficulty and insufficient time to finish job tasks. 73.6% of respondents reported difficulty finishing the tasks on time due to that taking more time to complete the task. In some cases, 88.3% of respondents speed up to finish the task on time. 34.3% of respondents claimed that the job doesn't require continuous and rapid physical activity, 51% of respondents claimed that job doesn't require continuous and rapid physical activity, and 48% claimed that work for long periods with your head or arm is physically awkward. It is shown that, workers working in a pressure environment and there is no ergonomic issue at the workplace.

Moreover, job control, sometimes referred to as decision latitude, defines the capacity to make decisions (decision authority) and the possibility to use job skills inside the work process (skill discretion) (Hervieux, 2022). Based on the findings, 57.8% of respondents reported making decisions before performing their job task, 61.8% of respondents participate in decision making, and 65.7% of respondents decided their own task changes and determined the time & speed job tasks and solved work problems by themselves. From their job task, 65.7% of respondents develop their work ability, 69.6% of respondents learn new things, 57.8% of respondents' jobs are more creative, and 82.4% of respondents undertake different tasks. From this part, workers are able to determine and decide the changes in their tasks and create their job more helpfully, but a high number of respondents undertake different tasks at the workplace.

Looking into the last part of the psychosocial is social support. Social support in the workplace refers to the degree of trust and relationships that exist among individuals, their organization, supervisors, and colleagues. It can be defined as the feedback an employee receives

on others' concern for them and their role within a team. Social support can provide emotional and instrumental resources, including companionship, moral encouragement, financial assistance, and job placement aid. Based on the findings, 95.5% of respondents reported workflow goes smoothly, and 79.4% of the working environment is comfortable. 70.6% of respondents depend on other colleagues for their job tasks and 86.3% of respondents would find their colleagues if they made any mistakes. A high number of respondents reported that supervisors are not paying much attention to workers, supervisors are not concerned about the welfare of workers, supervisors are not successful in getting people to work, not helpful in getting the job done smoothly, and don't get support if make any mistakes. From the analysis, the number of disagreeing and agreeing respondents for the supervisor support looks similar. Anyhow, 50% of the respondents don't receive support from their supervisor. This mainly relates to the direct labor of the operation department. This shows that workers get social support among colleagues rather than the superior at the workplace.

Psychosocial factors such as an imbalance between effort and reward, overcommitment, low job control, role conflict and ambiguity, high job demands, poor interpersonal relationships, job insecurity, lack of social support, and exposure to threats and violence at work significantly contribute to work-related sleep disturbances (Mokarami, 2020).

5.3.4 The Influence of Indoor Air Quality (IAQ), Noise Pollution, and Psychosocial on Sick Building Syndrome (SBS)

The findings of this study indicate that all three variables tested, which are indoor air quality, noise pollution, and psychosocial factors using correlation test. Indoor air quality and psychosocial factors have a significant negative relationship with sick building syndrome, while noise pollution has a significant positive relationship with sick building syndrome. However, noise pollution shows the highest value of beta, followed by psychosocial and indoor air quality. Besides that, indoor air quality and noise pollution is not affecting towards sick building syndrome in regression analysis whereas psychosocial is affecting towards sick building syndrome. It is due to the contrast analysis result noise pollution classified as moderator influencing variable towards sick building syndrome.

Indoor air quality, noise pollution, and psychosocial factors are influencing sick building syndrome, where the noise pollution indicates the strongest predictor of SBS. Even though the effects of these variables are in opposite directions, meaning that independent variable is increases and dependent variable is decrease; psychosocial is still influencing the dependent variable. Indoor air quality shows that emission of VOC gases is high due to the resin usage at the molding production. Some of the air ventilation have duct/particles possible of the ceiling is height, and workers can feel the heat radiation from the visual display unit and surrounding environment. Working near the molding machine is causing it to be hotter due to the nature of the molding process. Noise pollution shows that high noise occurs due to the repetitive process, difficult-to-listen-to instructions or communication due to the heavy noise and workers not using earmuff or ear plugs while working. Psychosocial shows that a high number of workers encountered work pressure and insufficient supervisor support compared to colleagues' support. Anyhow, they are

able to control their job and make their job more useful. The exposure from the air and noise leads psychological impact on workers, thus contributing to sick building syndrome among manufacturing workers. This finding is similar with previous studies where the researcher found that the most important predictor of SBS is indoor air quality, noise pollution and psychosocial.

5.4 Research Implications

5.4.1 Theoretical Implications

The aim of this study is to investigate the relationship between indoor air quality, noise, and psychosocial factors to sick building syndrome. There are various studies that have been conducted to determine the risk factors that affect the occurrence of sick building syndrome in different industries such as hospitality, education, construction, and so on. However, the relationship between noise pollution and sick building syndrome assessment is somehow low compared to indoor air quality and psychosocial.

This study focused on indoor air quality and psychosocial factors including the impact on manufacturing workers. The result of this study found that indoor air quality, noise pollution, and psychosocial factors had a significant relationship with sick building syndrome. This result is consistent with earlier study that found indoor air quality, noise pollution, and psychosocial factors to be the most significant factor of SBS.

This study managed to prove that indoor air quality and noise pollution lead psychological impact on workers, thus contributing to sick building syndrome among manufacturing workers, resulting in significant findings. As a result, the theoretical implications of creating a framework can be verified and utilized as a foundation for future study expansion into related fields.

5.4.2 Practical Implications

The study's conclusions have significant practical implications that go beyond academic studies but also in the organization in which the study was conducted. This study provides some support for future study for investigating prevalence of SBSs in association with health and mental well-being. For the organizational side, findings of this study will help to provide information, data, and suggestions related to factors in preventing development of SBS among manufacturing workers in order to improve their safety, health, and well-being.

Manufacturing companies have been operating for many decades and have experience in mass production manufacturing. The prevalent issues attributed to the building environment encompass headaches, irritation of the eyes, nose, or throat, coughing, dizziness, impaired concentration, and weariness. They had many pioneers or experienced workers that age in their 40s. As we know, workers who are in this aging stage are low in resilience to chronic wear and tear. Therefore, they were exposed to high-risk disorder and paid a higher health price in performing the same task as they grew older. On the other hand, the young generation is also facing work pressure or stress due to the nature of their job. The executive-level workers tend to feel more pressure from the issues rising and the urgency to solve the issues.

Sick building syndrome (SBS) can impact manufacturing employees by inducing various symptoms that result in diminished productivity and heightened absenteeism. Therefore, employers, in reducing the risk of SBS, maintain the good quality of cleaning and follow the schedule maintenance/inspection thus improving the health of manufacturing workers at the organization. In addition, choose eco-friendly cleaning techniques that effectively eradicate pollutants.

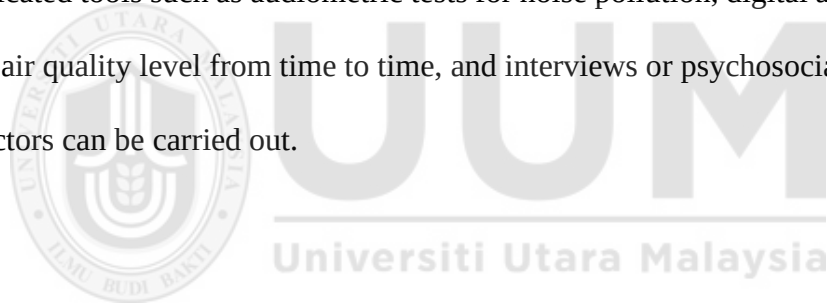
Findings of this study will be used to suggest and recommend improvement in terms of risk factors to prevent MSDs among manufacturing workers. Furthermore, it will enhance the stability of organizational performance with productivity improvement by the employees, reduce the cost spent for health treatment, reduce absenteeism, and reduce compensation as well as promote better quality of life at work.

5.5 Limitation of the Study

This study's execution is subject to some restrictions. The study was limited to one specific department only in a manufacturing company. The scope could be extended to other departments or other manufacturing for a wider scope and better generalization of the results. The scope of the present study was limited to production manufacturing activities only, which might potentially limit the findings. Other activities such as engineering, warehouse, quality control and maintenance might be able to provide a broader view in standing activities such as static or dynamic in development of SBS. Other possible limitations are the data collections relied on self-report questionnaires. As per findings, only Malaysians and Indonesians have responded to the questionnaire, but no other foreign workers. In addition, some of the respondents may answer the question just to satisfy the researcher and hide some information or not be honest in order to protect themselves or the company.

5.6 Suggestions for Future Research

This study offers fresh information for future studies looking at the prevalence of SBS in relation to physical and mental aspects such noise pollution, indoor air quality, and psychosocial components. However, understanding the impact of SBS at work and the nature of the relationship would require a larger study to be carried out. Having a larger sample composed of workers from different departments with various job level and including foreign workers and long-term health effects of SBS (respiratory disease, cardiovascular disease, and others) would improve the generalizability of the result. Future research could focus on quantitative methods that involved interviews, observations and assessments by trained personnel to obtain necessary data. To be precise, use dedicated tools such as audiometric tests for noise pollution, digital air monitor to test and analyze the air quality level from time to time, and interviews or psychosocial assessment for psychosocial factors can be carried out.



5.7 Recommendations

The suggested recommendation for this study is based on result findings. The result confirms that indoor air quality, noise pollution, and psychosocial factors show a significant relationship with sick building syndrome, SBS among production manufacturing workers. Therefore, a few recommendations are proposed in order to improve the building conditions and to overcome risk factors that can lead to the prevalence of SBS.

5.7.1 Recommendation 1

Indoor air quality is one of the factors adopted in this study. Therefore, the most important thing is that workers must understand and be aware of what the problems or risk factors associated with indoor air quality are that tends to sick building syndrome. Awareness will help workers to recognize hazards and substantially improve their health. Hence, management is responsible for eliminating the usage of carpets instead of using vinyl tiles, which don't emit odors. Additionally, solid wood furniture may release natural scents, particularly when it is freshly cut or newly polished. The species of wood (e.g., pine, oak, cedar) might affect the smell. Reduce the usage of detergent and chemicals in the building. Implement eco-friendly alternatives as cleaning agents in the buildings. Consistent training sessions and updates on the newest sustainable cleaning technologies and processes will ensure minimized chemical usage. Consistently service heating, ventilation, and air conditioning (HVAC) systems to avert mold proliferation within ducts and vents. Regularly replace filters and frequently clean ducts to prevent mold proliferation in these areas. Maintaining the building infrastructure such as, roofs without leaking, waterproof painting, and proper drainage, can prevent fungal growth in the building environment.

5.7.2 Recommendation 2

Noise pollution is one of the factors adopted in this study. Therefore, the most important things are that workers must understand and be aware what the problems or risk factors associated with noise pollution tend to cause sick building syndrome. Select the appropriate level of auditory protection according to the intensity and duration of noise exposure. This encompasses earplugs and earmuffs. Ensure that employees receive enough training on the utilization of hearing protection and promote routine maintenance or replacement of the personal protective equipment. Safety officers regularly perform assessments using noise dosimeters to evaluate individual worker exposure. This ensures that employees utilize hearing protection in accordance with safety rules. Instruct staff on the hazards of excessive noise and the significance of utilizing hearing protection. Deliver instruction on identifying noisy environments, the correct usage of earplugs or earmuffs, and the need to safeguard auditory health. Install conspicuous signage in loud environments to encourage personnel to utilize hearing protection and enhance knowledge of noise exposure. The engineering team needs to establish a preventive maintenance program to routinely maintain machinery and equipment. Numerous manufacturing machines increase noise as they age or as components deteriorate. Consistent maintenance, encompassing the lubrication of moving parts and the replacement of deteriorated components, can markedly diminish noise. Ensure that devices equipped with exhaust systems, such as compressors or engines, are installed with soundproof mufflers and clean air filters to reduce noise emissions. Management can implement noise management by installing monitoring systems in critical locations of the facility. These devices can monitor noise levels in real time and issue notifications when limits are surpassed. Management should set goals to mitigate exposure to detrimental noise levels, hence enhancing employee well-being and augmenting overall productivity and happiness.

5.7.3 Recommendation 3

Psychosocial is the one of the factors adopted in this study. Therefore, the foremost important things are that workers must understand and be aware what the problems or risk factors associated with psychosocial tends to sick building syndrome. Implementing efficient psychosocial management in a manufacturing setting is crucial for promoting employee well-being, strengthening mental health, increasing productivity, and mitigating stress. Manufacturing environments, typically marked by substantial workloads, repetitive duties, shift work, and inherent safety risks, can adversely affect workers' mental and emotional well-being. Management can conduct annual surveys, interviews, and focus groups to obtain direct input from employees regarding their psychosocial well-being. Instruments such as 'Job Stress Surveys' or 'Workplace Well-Being Surveys' can assist in pinpointing particular issues. Elevated absenteeism, turnover, or recurrent health-related absences may signify underlying psychosocial problems. Based on the absenteeism, management can conduct interviews with workers to understand more about the reason for the absence. Promote candid and transparent communication between staff and management. Instruments such as 'Skip Level Meeting' 'Coffee with Manager/Director' can assist workers in having open talks with higher-level management. Implement routine check-ins with supervisors to facilitate bidirectional communication, enabling employees to articulate problems, suggestions, or requirements. Ensure that workers are not subjected to excessive productivity targets or hazardous work practices. This can reduce mental strain. Ultimately, an emphasis on psychosocial management not only improves the mental health and well-being of employees but also fosters enhanced overall performance, safety, and retention within the manufacturing sector.

5.8 Conclusion

This study covered the connection between indoor air quality, noise pollution, and psychological factors and sick building syndrome (SBS) in this chapter. The dependent variable (sick building syndrome, or SBS) exhibits a substantial correlation with all three independent factors (indoor air quality, noise pollution, and psychological). The study's theoretical and practical implications have been examined. Additionally, certain recommendations were made for future studies that would use a quantitative approach to examine the long-term health effects of SBS, including other department employees. Finally, several suggestions are made to the company to enhance the building conditions, address risk factors that may contribute to the prevalence of SBS in manufacturing workers and enhance their physical and mental health.



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APPENDIX

APPENDIX A

Raosoftware Calculator; Recommended Sample Size is **92**



What margin of error can you accept? %
5% is a common choice

What confidence level do you need? %
Typical choices are 90%, 95%, or 99%

What is the population size?
If you don't know, use 20000

What is the response distribution? %
Leave this as 50%

Your recommended sample size is **92**

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APPENDIX B

Survey Questionnaire

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION

BAHAGIAN A: SOSIO-DEMOGRAFI INFORMASI

1 Job Position/ Jawatan Kerja

- ☐ Supervisor/ *Penyelia*
- ☐ Engineer/ *Jurutera*
- ☐ Operator/ *Operator*
- ☐ Technician/ *Juruteknik*
- ☐ General worker/ *Pekerja Am*

2 Gender/ Jantina

- ☐ Male/ *Lelaki*
- ☐ Female/ *Perempuan*

3 Age/Umur

- ☐ Below 25 years/ *Bawah 25 tahun*
- ☐ 25-30 years/ *25-30 tahun*
- ☐ 31-35 years/ *31-35 tahun*
- ☐ 36-40 years/ *36-40 tahun*
- ☐ Above 40 years/ *Atas 40 tahun*

4 Nationality/Kewarganegaraan

- ☐ Malaysian/ *Malaysia*
- ☐ Indonesian/ *Indonesia*
- ☐ Bangladeshi/ *Bangladesh*
- ☐ Nepalese/ *Nepal*
- ☐ Others/ *Lain-lain* : _____ (Pls specify/ *Sila nyatakan*)

5 Academic Qualification/ Kelayakan akademik

- ☐ Primary school/ *Sekolah rendah*
- ☐ SPM/ *SPM*
- ☐ Certificate/ *Sijil*
- ☐ Diploma/ *Diploma*
- ☐ Degree/ *Ijazah*
- ☐ Other/ *Lain-lain* : _____ (Pls specify/ *Sila nyatakan*)

6 How long you have been working in the company?/ Sudah berapa lamakah anda bekerja di organisasi ini?

- | | |
|--------------------------|--|
| ☐ | Less than 1 year/ <i>Kurang dari 1 tahun</i> |
| ☐ | 1-4 years/ <i>1-4 tahun</i> |
| ☐ | 5-10 years/ <i>5-10 tahun</i> |
| ☐ | More than 10 years/ <i>Lebih dari 10 tahun</i> |

7 Working Department/ Jabatan Kerja

- | | |
|--------------------------|---------------------------|
| ☐ | Molding/ <i>Molding</i> |
| ☐ | Assembly/ <i>Assembly</i> |



Section B: Sick Building Syndrome (SBS)/ Bahagian B: Sindrom bangunan

1 In the past 12 months have you had more than two times of: /Dalam tempoh 12 bulan yang lalu, adakah anda mempunyai lebih daripada dua kali:

☐	Dryness of eyes/ Kekeringan mata
☐	Itchy or watery of eyes/ Gatal atau mata berair
☐	Blocked nose /Hidung tersumbat
☐	Runny nose /Selsema

2 How frequent was the symptom? /Berapa kerapkah gejala itu?

☐	Every day at work /Setiap hari di tempat kerja
☐	3-4 days each work /3-4 hari setiap kerja
☐	1-2 days each work /1-2 hari setiap kerja
☐	Every 2-3 weeks /Setiap 2-3 minggu
☐	Less often /Kurang kerap

3 How much control do you personally have over the temperature of working environment?/ Se jauh manakah anda mempunyai kawalan ke atas suhu persekitaran kerja berikut?

1	2	3	4
None/	Minimum	Control/	Full
Tiada	control/	Kawalan	control/
	Kawalan		Kawalan
	minimum		penuh

4 How much control do you personally have over the ventilation of working environment?/ Se jauh manakah anda mempunyai kawalan ke atas pengudaraan persekitaran kerja berikut?

1	2	3	4
None/	Minimum	Control/	Full
Tiada	control/	Kawalan	control/
	Kawalan		Kawalan
	minimum		penuh

5 How much control do you personally have over the lighting of working environment?/ Se jauh manakah anda mempunyai kawalan ke atas pencahayaan persekitaran kerja berikut?

1	2	3	4
None/	Minimum	Control/	Full
Tiada	control/	Kawalan	control/
	Kawalan		Kawalan
	minimum		penuh

6 Is the amount of privacy which you have at work place satisfactory or unsatisfactory? /Adakah jumlah privasi yang anda miliki di tempat kerja memuaskan atau tidak memuaskan?

1	2	3	4
---	---	---	---

None/ Minimum Control/ Full

Tiada control/ Kawalan control/
Kawalan Kawalan
minimum penuh

7 How much do you like the layout in your office? /Sejauh manakah anda menyukai susun atur di pejabat anda?

1	2	3	4
---	---	---	---

None/ Minimum Control/ Full

Tiada control/ Kawalan control/
Kawalan Kawalan
minimum penuh

8 How much do you like the decoration in your office? /Sejauh manakah anda menyukai hiasan di pejabat anda?

1	2	3	4
---	---	---	---

None/ Minimum Control/ Full

Tiada control/ Kawalan control/
Kawalan Kawalan
minimum penuh

9 Do you smoke?

☐	Yes
☐	No



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If yes, please specify how many cigattes taken during working _____

Section C: Indoor Air Quality (IAQ)

Bahagian C: Kualiti udara dalaman

1 Please indicate if you work with or near computer/ Sila nyatakan jika anda bekerja dengan atau berhampiran komputer.

☐	Everyday/ Setiap hari
☐	2-3 times/week / 2-3 kali seminggu
☐	Never/ Tiada

2 Please indicate if you work with or near photocopy machine/ Sila nyatakan jika anda bekerja dengan atau berhampiran mesin fotostat.

☐	Everyday/ Setiap hari
☐	2-3 times/week / 2-3 kali seminggu
☐	Never/ Tiada

3 Please indicate if you work with or near fax machine/ Sila nyatakan jika anda bekerja dengan atau berhampiran mesin faks.

☐	Everyday/ Setiap hari
☐	2-3 times/week / 2-3 kali seminggu
☐	Never/ Tiada

4 Heat radiation gives discomfort from visual display units/ Sinaran haba memberikan ketidakselesaan daripada unit paparan visual

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

5 Radiant heat from warm window surfaces gives discomfort/ Haba pancaran dari permukaan tingkap yang hangat memberikan ketidakselesaan

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

6 Air reach all parts of the office or there are no dead spaces/ Udara mencapai semua bahagian pejabat atau tiada ruang mati

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

7 Temperature, relative humidity and air flow rates are check regularly during working hours/ Suhu, kelembapan relatif dan kadar aliran udara diperiksa secara berkala semasa waktu bekerja?

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

8 Noticeable odours emit by furniture,furnishings,carpets/ Bau yang ketara dikeluarkan oleh perabot, perabot, permaidani.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

9 Usage of detergent, pesticides or other chemicals in the building/Penggunaan detergen, racun perosak atau bahan kimia lain di dalam bangunan.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

10 The building environment is clean/ Persekitaran bangunan bersih.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

11 Sufficient of air supply and extraction of air ventilation in every room or area/ Mencukupi bekalan udara dan pengekstrakan pengudaraan udara di setiap bilik atau kawasan

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

12 Accumulation of around the air vents/Pengumpulan di sekeliling lubang udara.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

13 Outdoor air intake duct located:/ Saluran pengambilan udara luar terletak i)Near the cooling tower in building/Berhampiran menara penyejuk dalam bangunan.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

14 Outdoor air intake duct located:/ Saluran pengambilan udara luar terletak: ii)Near adjacent building/ Berhampiran bangunan bersebelahan

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

15 Outdoor air intake duct located:/ Saluran pengambilan udara luar terletak: iii)At street/Di jalan

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

16 Outdoor air intake duct located:/ Saluran pengambilan udara luar terletak: iv) Near car park /Berhampiran tempat letak kereta

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

17 Outdoor air get into the building/ udara luar masuk ke dalam bangunan.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

18 Cleaning and maintenance of the air conditioning system as per scheduled in the building/ Pembersihan dan penyelenggaraan sistem penyaman udara mengikut jadual di dalam bangunan

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

19 Visible fungal growth or mouldy odour in the building/ Kelihatan pertumbuhan kulat atau bau berkulat di dalam bangunan.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

20 Presence of hazardous substances in the building/ Kehadiran bahan berbahaya di dalam bangunan.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

Section D: Noise pollution

Bahagian D: Pencemaran bunyi

1 Communicate with someone about one meter away with high raised voice/Berkomunikasi dengan seseorang kira-kira satu meter jauhnya dengan suara yang tinggi.

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

2 Reduction in hearing over the course of the day Example: Need to turn up the radio on the way home, etc. /Pengurangan dalam pendengaran sepanjang hari Contoh: Perlu menghidupkan radio semasa perjalanan pulang, dsb.

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

3 Using noisy powered tools or machinery at your workplace/ Menggunakan alat atau mesin berkuasa yang bising di tempat kerja anda

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

4 Noises due to impacts or explosive sources

Example:

(a) Noise due to impact - hammer, pneumatic impact tools

(b) Explosive source - explosive powered tools, detonators, etc/

Bunyi akibat hentaman atau sumber letupan

Contoh:

(a) Bunyi akibat hentaman - tukul, alatan hentaman pneumatik

(b) Sumber bahan letupan - alatan berkuasa letupan, detonator, ds

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

5 Using personal hearing protectors (PHP) used for some work.

Example: Ear muff/

Menggunakan pelindung pendengaran peribadi (PHP) yang digunakan untuk beberapa kerja.

Contoh: Penutup telinga

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

6 Experience of ringing in the ears or sound heard differently in each ear/ Pengalaman berdengung di telinga atau bunyi yang didengar secara berbeza di setiap telinga.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

7 Too much noise or that can't hear instruction clearly/ Terlalu banyak bunyi atau yang tidak dapat mendengar arahan dengan jelas?

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

8 Experiencing difficulties in hearing after working at the current organization/ Mengalami masalah pendengaran selepas bekerja di organisasi semasa

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

9 Equipment consists of manufacturers's information (including labels) indicating noise levels:

(a) peak sounds pressure level of 140dB(C)

(b) sound pressure level of 82 db(A)/

Peralatan terdiri daripada maklumat pengeluaran (termasuk label) yang menunjukkan tahap hingar:

(a) tahap tekanan bunyi puncak 140dB(C)

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

Section E: Psychosocial

Bahagian E: Psikososial

1 You are working under the extensive work pressure/ Anda bekerja di bawah tekanan kerja yang meluas.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control / Kawalan	Full control/ Kawalan penuh

2 Difficulty to finish your tasks on time/ Kesukaran untuk menyelesaikan tugas anda tepat pada masa.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control / Kawalan	Full control/ Kawalan penuh

3 Take extra hours to finish your job tasks/ Ambil masa tambahan untuk menyelesaikan tugas kerja anda

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control / Kawalan	Full control/ Kawalan penuh

4 Have enough time to finish your job tasks/ Mempunyai masa yang cukup untuk menyelesaikan tugas kerja anda?

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control / Kawalan	Full control/ Kawalan penuh

5 Speed up to finish your tasks on time/ Mempercepatkan untuk menyelesaikan tugas anda tepat pada masanya.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control / Kawalan	Full control/ Kawalan penuh

6 Find your work tasks as difficult/ Mendapati tugas kerja anda sebagai sukar.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control / Kawalan	Full control/ Kawalan penuh

7 Job requires to move or lift a heavy load/ Pekerjaan memerlukan untuk memindahkan atau mengangkat beban yang berat.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control / Kawalan	Full control/ Kawalan penuh

8 Have too many job tasks/ Mempunyai terlalu banyak tugas pekerjaan

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

9 Job requires continuous and rapid physical activity/ Pekerjaan memerlukan aktiviti fizikal yang berterusan dan pantas.

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

10 Required to work long with your body in an awkward position/ Diperlukan untuk bekerja lama dengan badan anda dalam kedudukan yang janggal

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

11 Work for long periods with your head or arm physically awkward/ Bekerja untuk tempoh yang lama dengan kepala atau lengan anda janggal secara fizikal.

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

12 Decision before perform your job task/ Keputusan sebelum melaksanakan tugas pekerjaan anda.

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

13 Participate in decision making/ Mengambil bahagian dalam membuat keputusan

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

14 Decide your own task changes/ Tentukan perubahan tugas anda sendiri.

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

15 Determine the time & speed job tasks and solve work problems by yourself/ Tentukan masa & tugas kerja yang pantas dan selesaikan masalah kerja sendiri

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

16 Your work develops your abilities/ Kerja anda mengembangkan kebolehan anda.

1	2	3	4	5
---	---	---	---	---

None/ Slightly Neutral / Control / Full
Tiada control/ Neutral Kawalan control/
Kawalan Kawalan
sikit penuh

17 Learn new things from my work/ Belajar perkara baru dari kerja saya.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

18 Your work is more creativity/ Kerja anda lebih kreativiti

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

19 You are undertake different tasks at my work/ Jalankan tugas yang berbeza di tempat kerja anda.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

20 Your workflow goes smoothly at workplace/ Aliran kerja saya berjalan lancar di tempat kerja.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

21 You can ask and enquire at work/ Anda boleh bertanya dan bertanya di tempat kerja

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

22 Your task depends on other colleagues/ Tugas saya bergantung kepada rakan sekerja yang lain.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

23 Your working atmosphere is comfortable/ Suasana kerja saya selesa.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral Neutral	Control Kawalan	Full control/ Kawalan penuh

24 If I made a mistake in my work task, I will find support from my colleagues/ Jika saya membuat kesilapan dalam tugas kerja saya, saya akan mendapat sokongan daripada rakan sekerja saya.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

25 If you made a mistake in your work task, you find support from your supervisors/ Jika anda membuat kesilapan dalam tugas kerja anda, anda mendapat sokongan daripada penyelia anda.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

26 Your colleagues are friendly/ Rakan sekerja anda mesra.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

27 Your supervisor is friendly/ Penyelia anda ramah.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

28 Your supervisor pays attention to what I am saying/ Penyelia anda memberi perhatian kepada apa yang saya katakan.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

29 Your supervisor is concerned about the welfare of those under him/her/ Penyelia anda mengambil berat tentang kebajikan mereka di bawahnya

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

30 Your supervisor successful in getting people to work together/ Penyelia anda berjaya mendapatkan orang ramai untuk bekerjasama.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

31 Your supervisor helpful in getting the job done/ Penyelia anda membantu dalam menyiapkan kerja.

1	2	3	4	5
None/ Tiada	Slightly control/ Kawalan sikit	Neutral / Neutral	Control / Kawalan	Full control/ Kawalan penuh

APPENDIX C

Normality Analysis

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
DV_SBS	.088	102	.047	.983	102	.203
IVi_IAQ	.099	102	.016	.975	102	.047
IVii_NP	.113	102	.003	.950	102	.001
IViii_P	.093	102	.030	.968	102	.015

a. Lilliefors Significance Correction



Appendix D

Demography Frequency Analysis

		Job Position			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Supervisor	4	3.9	3.9	3.9
	Enngineer	22	21.6	21.6	25.5
	Operator	33	32.4	32.4	57.8
	Technician	19	18.6	18.6	76.5
	General Worker	3	2.9	2.9	79.4
	others	21	20.6	20.6	100.0
	Total	102	100.0	100.0	

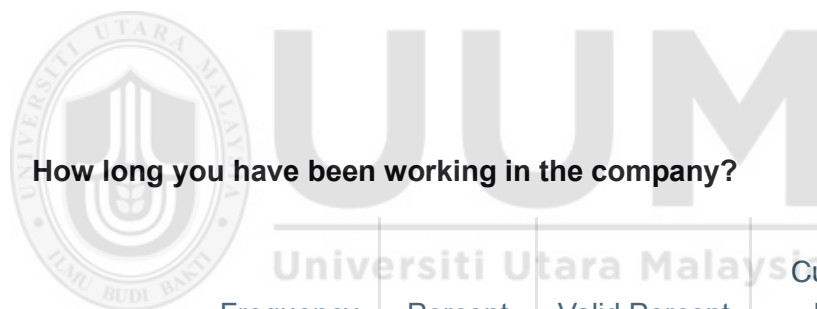
		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	39	38.2	38.2	38.2
	Female	63	61.8	61.8	100.0
	Total	102	100.0	100.0	

		Age			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 25 years	29	28.4	28.4	28.4
	25 - 30 years	28	27.5	27.5	55.9
	31 - 35 years	21	20.6	20.6	76.5
	36 - 40 years	13	12.7	12.7	89.2
	Above 40 years	11	10.8	10.8	100.0
	Total	102	100.0	100.0	

		Nationality			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Malaysian	98	96.1	96.1	96.1
	Indonesia	1	1.0	1.0	97.1
	Bangladeshi	2	2.0	2.0	99.0
	Nepalese	1	1.0	1.0	100.0
	Total	102	100.0	100.0	

Academic Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary school	4	3.9	3.9	3.9
	SPM	24	23.5	23.5	27.5
	Certificate	10	9.8	9.8	37.3
	Diploma	22	21.6	21.6	58.8
	Degree	38	37.3	37.3	96.1
	Other	4	3.9	3.9	100.0
	Total	102	100.0	100.0	



How long you have been working in the company?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 1 years	25	24.5	24.5	24.5
	1 - 4 years	42	41.2	41.2	65.7
	5 - 10 years	20	19.6	19.6	85.3
	more than 10 years	15	14.7	14.7	100.0
	Total	102	100.0	100.0	

Working Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Molding	26	25.5	25.5	25.5
	Assembly	52	51.0	51.0	76.5
	others	24	23.5	23.5	100.0
	Total	102	100.0	100.0	



Appendix E

Descriptive Statistics of IAQ

		Please indicate if you work with or near computer. / Sila nyatakan jika anda bekerja dengan atau berhampiran computer.	Please indicate if you work with or near photocopy machine. / Sila nyatakan jika anda bekerja dengan atau berhampiran mesin fotostat.	Please indicate if you work with or near fax machine. / Sila nyatakan jika anda bekerja dengan atau berhampiran mesin faks.
N	Valid	102	102	102
	Missing	0	0	0
Mean		1.22	2.28	2.77
Std. Deviation		.519	.872	.595

APPENDIX F

Frequency Table

Please indicate if you work with or near computer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	everyday	85	83.3	83.3	83.3
	2 - 3 times a week	12	11.8	11.8	95.1
	never	5	4.9	4.9	100.0
	Total	102	100.0	100.0	

Please indicate if you work with or near photocopy machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	everyday	28	27.5	27.5	27.5
	2 - 3 times a week	17	16.7	16.7	44.1
	never	57	55.9	55.9	100.0
	Total	102	100.0	100.0	

Please indicate if you work with or near fax machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	everyday	9	8.8	8.8	8.8
	2 - 3 times a week	5	4.9	4.9	13.7
	never	88	86.3	86.3	100.0
	Total	102	100.0	100.0	

APPENDIX G

Chi Square Analysis

Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
In the past 12 months have you had more than two times of: /Dalam tempoh 12 bulan yang lalu, adakah anda mempunyai lebih daripada dua kali: * How frequent was the symptom? /Berapa kerapkah gejala itu?	102	100.0%	0	0.0%	102	100.0%

In the past 12 months have you had more than two times of: How frequent was the symptom? Crosstabulation

			How frequent was the symptom? /Berapa kerapkah gejala itu?	
			every day at work	3 - 4 days each work
In the past 12 months have you had more than two times of: /Dalam tempoh 12 bulan yang lalu, adakah anda mempunyai lebih daripada dua kali:	dryness of eyes	Count	0	1
		Expected Count	.3	.2
	Itchy or watery of eyes	Count	0	1
		Expected Count	.4	.3

	Blocked nose	Count	1	0
		Expected Count	.6	.4
	Runny nose	Count	2	0
		Expected Count	1.7	1.1
Total		Count	3	2
		Expected Count	3.0	2.0

In the past 12 months have you had more than two times of: How frequent was the symptom? Crosstabulation

			How frequent was the symptom? /Berapa kerapkah gejala itu?	
			1 - 2 days each work	Every 2 - 3 weeks
In the past 12 months have you had more than two times of: /Dalam tempoh 12 bulan yang lalu, adakah anda mempunyai lebih daripada dua kali:	dryness of eyes	Count	0	4
		Expected Count	1.0	3.2
	Itchy or watery of eyes	Count	2	8
		Expected Count	1.1	3.8
	Blocked nose	Count	4	9
		Expected Count	1.8	5.9
	Runny nose	Count	3	9
		Expected Count	5.1	17.1

Total	Count	9	30
	Expected Count	9.0	30.0

In the past 12 months have you had more than two times of: How frequent was the symptom? Crosstabulation

			How frequent was the symptom? /Berapa kerapkah gejala itu?	
			less often	Total
In the past 12 months have you had more than two times of: /Dalam tempoh 12 bulan yang lalu, adakah anda mempunyai lebih daripada dua kali:	dryness of eyes	Count	6	11
		Expected Count	6.3	11.0
	Itchy or watery of eyes	Count	2	13
		Expected Count	7.4	13.0
	Blocked nose	Count	6	20
		Expected Count	11.4	20.0
	Runny nose	Count	44	58
		Expected Count	33.0	58.0
Total	Count	58	102	
	Expected Count	58.0	102.0	

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	33.283 ^a	12	.001
Likelihood Ratio	34.686	12	.001
Linear-by-Linear Association	4.492	1	.034
N of Valid Cases	102		



APPENDIX H

Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
DV_SBS	102	11.00	31.00	20.4706	3.90406
IVi_IAQ	102	35.00	67.00	49.7549	7.13579
IVii_NP	102	9.00	45.00	26.2745	5.41753
IViii_P	102	62.00	139.00	96.5588	17.04251
Valid N (listwise)	102				



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APPENDIX I

Correlation Analysis

		DV_SBS	IVi_IAQ	IVii_NP	IViii_P
Pearson Correlation	DV_SBS	1.000	-.393	.090	-.426
	IVi_IAQ	-.393	1.000	-.079	.731
	IVii_NP	.090	-.079	1.000	-.094
	IViii_P	-.426	.731	-.094	1.000
Sig. (1-tailed)	DV_SBS	.	.000	.183	.000
	IVi_IAQ	.000	.	.214	.000
	IVii_NP	.183	.214	.	.173
	IViii_P	.000	.000	.173	.
N	DV_SBS	102	102	102	102
	IVi_IAQ	102	102	102	102
	IVii_NP	102	102	102	102
	IViii_P	102	102	102	102

APPENDIX J

Multregression Analysis

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.445 ^a	.198	.173	3.54928	1.933

a. Predictors: (Constant), IViii_P, IVii_NP, IVi_IAQ

b. Dependent Variable: DV_SBS

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	304.869	3	101.623	8.067	.000 ^b
	Residual	1234.543	98	12.597		
	Total	1539.412	101			

a. Dependent Variable: DV_SBS

b. Predictors: (Constant), IViii_P, IVii_NP, IVi_IAQ

APPENDIX K

Cronbach Alpha

i. Sick Building Syndrome

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.448	.348	8

ii. Indoor Air Quality

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.453	.489	20



iii. Noise Pollution

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.900	.900	9

iv. Psychosocial

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.767	.774	31

