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RESEARCH ARTICLE

A Study of Physically Disabled Employees in the Pre-Press Printing Sector

Muhammad Syawal Zahari[1], Shalida Mohd Rosnan[2*]

[1]Postgraduate Studies, Faculty of Art & Design, Kompleks Ilham, Universiti Teknologi MARA, 40450 Shah Alam, Selangor Darul Ehsan, Malaysia
Email: syawalmuhd99@gmail.com
[2]Department of Printing Technology, Faculty of Art & Design, Kompleks Alam Bina & Seni Reka, UiTM Puncak Alam Campus, 42300 Bandar Puncak Alam, Selangor Darul Ehsan, Malaysia
Email: shalida@uitm.edu.my

CORRESPONDING AUTHOR (*):
Shalida Mohd Rosnan
(shalida@uitm.edu.my)

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ABSTRACT

This study examines workplace accessibility for physically disabled employees in the pre-press department of the Malaysian printing industry. Although government policies and incentives encourage the employment of people with disabilities (PWDs), their participation remains limited, primarily due to insufficient facilities and low employer awareness. The research seeks to identify the specific needs of physically disabled workers in pre-press departments. A mixed-methods approach was adopted, combining quantitative data from an online survey distributed to printing companies under the *Persatuan Pengusaha Pencetakan Melayu Malaysia* (PPPMM) with qualitative insights from interviews involving HR managers, expert architects, representatives from the Disability Services and Development Division, and disabled workers themselves. Findings revealed that only 4.8% of the companies surveyed employed individuals with disabilities, and only a minority provided suitable toilets, ramps, desk arrangements, or lifts. The study identified the needs of physically disabled workers for prepress departments, including minimum workspace width, ergonomic furniture, door dimensions, and accessible toilet designs. Therefore, these recommendations can remove physical barriers and improve the functionality, safety, and dignity of disabled workers. They can also contribute practical solutions for employers and policymakers to promote workplace inclusion and the participation of disabled people in the printing industry.

Contribution/Originality: This study contributes to the existing body of knowledge by specifically addressing the under-researched intersection of the printing industry and workplace accessibility for physically disabled individuals in Malaysia. The discovery that this specific stage of printing is the most viable entry point for wheelchair users, due to its low physical demands.

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1. Introduction

In the The Fifth Industrial Revolution is a pivotal moment in the evolution of industrial advancement, skills, and workforce, particularly for workers with disabilities (PWDs) in the industrial sector (Ziatdinov et al., 2024). Within this framework, humans will continue to play a major role in the future of performing work, including for PWDs in the printing industry. In Malaysia, the sector plays a key role in economic development and the dissemination of information. The significant growth in recent years has been driven by technological advances and increasing demand (Masod Muhammad Yusuf & Zakaria Siti Farhana, 2024). According to the Department of Statistics Malaysia (2023), the number of employees in the printing industry is 69,227, which is 5.4% of the country's total workforce. The workflow of the printing industry is generally divided into three main stages: Pre-Press, Press, and Post-Press (Hoffmann-Walbeck, 2021). The Pre-Press stage encompasses tasks such as graphic design, desktop publishing (DTP), color correction, quality control, operation of computer-to-plate (CTP) machines, and preparation of printing plates. Following this, the Press stage involves activities like operating printing machines, managing printing production, performing technical maintenance, and handling both offset and digital printing operations. Finally, the Post-Press stage includes tasks related to final quality control, general labor, folder glue operation, as well as finishing and binding work. Each of these stages plays a crucial role in ensuring the smooth and efficient production of printed materials.

Each level has the potential to offer employment to PWDs, especially PWDs, depending on the skill level and suitability of the task. The Pre-Press section is particularly suitable for workers in wheelchairs or with limited mobility because most of the work is done on computers and requires technical skills and creativity, not physical strength. On the other hand, the Press and Post-Press sections require greater mobility and physical strength. However, opportunities still exist if the workplace is adapted, such as the use of adjustable desks, machines with appropriate height, or special assistive devices. The work process in the Press and Post-Press sections involves interaction with printing machines and technical operations that require physical ability, which increases the risk of injury and ergonomic stress for workers (Ibrahim, 2024). A study by the Federal Ministry of Social Affairs, Consumer Protection (2020) shows that digitalization and the use of assistive technology provide inclusive opportunities for PWDs to engage in digital tasks that are not tied to physical mobility capabilities. This makes the Pre-Press department stand out as the most suitable department for the involvement of PWDs. By adapting the workplace based on universal design principles, employers can open up more opportunities for this group, thus leveraging talents that are often marginalized.

Universal design is defined as the design of products, environments, programs, and services that can be used by all people according to their abilities without the need for adaptations or special designs. It includes the provision of assistive devices for specific PWD groups, where necessary (Ministry of Women, Family and Community Development, 2008). Physically disabled individuals are individuals who have limitations in their ability to move freely in the workplace. Alexander et al. (2024) reported that this group faces various barriers in employment. However, with special accommodations in the workplace, they can perform tasks relevant to the printing industry, including supervising the printing process and operating equipment with the support of assistive technology. Kim et al. (2020) state that employees who have access to better facilities for individuals with disabilities are more likely to perceive their workplace as safe and experience better job satisfaction. With that, providing guidelines

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to employers to develop an inclusive workplace is the best way to hire employees with disabilities (Bonaccio et al., 2019). The importance of accessibility and universal design principles in promoting equal opportunity by emphasizing the potential benefits of promoting inclusion and accessibility in the workplace. Accessibility not only involves physical infrastructure such as ramps and lifts but also technology, policies, and organizational culture that support inclusion. It is necessary to take appropriate measures to ensure that persons with disabilities have access, like others, to the physical environment, transport, information, and communication (United Nations, 2007). This includes adaptable work equipment, flexible workspaces, and work procedures that take into account the special needs of disabled workers. According to the OKU Policy's strategy, a barrier-free environment must be provided, including facilities inside and outside buildings, workplaces, residential areas, and public spaces (Jabatan Kebajikan Masyarakat, 2016). According to the Department of Social Welfare, persons with disabilities (PWD) are defined as those with long-term physical, mental, intellectual, or sensory impairments that, when interacting with various barriers, may restrict their full and effective participation in society (Disabled Persons Act 2008). People with disabilities have seven categories: disabled hearing, visual, speech, physical, learning, mental, and multiple disabilities (Jabatan Kebajikan Masyarakat, 2021).

"Physical disability" refers to a physical condition that affects a person's mobility, physical capacity, stamina, or dexterity. It includes spinal cord injury, multiple sclerosis, cerebral palsy, spina bifida, amputation, muscular dystrophy, heart conditions, paralysis, polio, stroke, and many other conditions (Kim et al., 2020). According to the Public Services Commission of Malaysia, a person with a physical disability is a person who has a limb defect, either a loss of function or lack of a limb in any part of the body, including an imperfect condition of the limb that will affect his abilities (*Suruhanjaya Perkhidmatan Awam Malaysia - Kategori Orang Kurang Upaya*). According to the Department of Social Welfare, each type of disabled person is categorized into specific divisions. For instance, physical disabilities include seven subcategories such as limb disabilities, spinal cord injuries, strokes, dwarfism, traumatic brain injuries, cerebral palsy, and others (Jabatan Kebajikan Masyarakat, 2021). Physical disability allows them to move freely in daily activities such as work, where they have equal rights in providing employment opportunities and special facilities. Do not be caused by various disabilities, disabled people cannot be fully used, even if they want to be involved in daily work routines and can work as motivated workers (Mark et al., 2019). Rosli et al. (2015) said employment opportunities in Malaysia are wide, especially at the professional, semi-professional, technical, scientific and managerial levels. However, employers in the industry need to provide special facilities to those in need because individuals with special needs are an untapped source of national capital, and most of them have a lot of potential that can stand out in terms of commitment at work.

This study seeks to examine workplace accessibility in pre-press departments within the printing industry, focusing on the facilities required to support physically disabled workers. The goal is to promote greater workplace inclusion and accessibility for this group of employees. In managing human resources for people with disabilities, organizations must recognize the importance of respecting individual differences, particularly in communication with workers who have special needs. Such interactions often present challenges in addressing their requirements, including suitable facilities and infrastructure (Poernomo, Omboto, & Tinka, 2022). By exploring the barriers faced by physically disabled workers, this research aims to highlight areas for improvement that can enhance their participation in the printing industry. Specifically, the paper

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presents findings on the challenges encountered by these workers and the facilities currently available in pre-press departments. Identifying their special needs will enable printing companies to make more informed decisions in implementing changes that foster inclusivity and a supportive work environment.

1.1. Research Objectives

i. To find out the special facilities requirements in the pre-press department that need to be provided for workers with physical disabilities in the printing industry.
ii. To propose a guideline for facility layout in the pre-press department for workers with physical disabilities in the printing industry.

2. Literature Review

While numerous studies have examined disability in general, limited attention has been directed toward the specific facilities required by physically disabled workers in the printing industry. Therefore, this section reviews previous research related to special facilities for individuals with physical disabilities, particularly in the context of employment within pre-press departments of the printing industry. The primary objective is to identify the essential needs in this department that can better support employees with physical disabilities. In Malaysia, official records indicate that multiple categories of disabilities are recognized, with physical disabilities being one of the most commonly registered groups. Despite this, employer and organizational awareness of disability-friendly facilities remains low, especially in industrial sectors such as printing. A lack of understanding regarding the importance of accessibility and inclusive workplace design has contributed to many disabled individuals being excluded from employment or unable to perform optimally in their roles. By reviewing existing studies, this research aims to identify established knowledge as well as gaps that persist in addressing this issue. This analysis emphasizes the limited body of research focusing on inclusive work environments and specific workplace facilities within the printing industry, highlighting the urgent need to enhance awareness and action among stakeholders.

2.1. Overview of Persons with Disabilities in Malaysia

According to the Twelfth Malaysia Plan 2021–2025 (12th Plan), it was projected that between 2016 and 2019, approximately one million jobs would be generated, primarily in the services and manufacturing sectors. However, the unemployment rate increased to 4.5% in 2020 (Ministry of Economy, 2021). Data from MASCO 2020 revealed that the employment of persons with disabilities (PWDs) in the private sector remains limited, with the majority employed in manufacturing and assembly (51 workers), while very few are engaged in professional and engineering fields. This reflects a lack of inclusivity in service and management sectors, which often demand strong communication skills and physical capabilities. Consequently, private companies are urged to adopt more proactive measures by providing disability-friendly facilities, specialized training, and inclusive employment policies to enhance the participation of PWDs in industries such as printing (Ministry of Human Resources, 2024). In the private sector, the challenges faced by disabled workers vary depending on the type of disability, including physical, visual, hearing, speech, learning, or multiple disabilities. For those with physical impairments, navigating non-accessible workplaces and operating machinery pose

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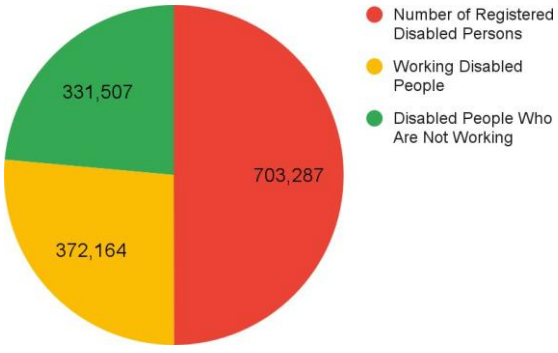
significant difficulties. Workers with vision and hearing disabilities are hindered by the lack of assistive technologies and communication tools, despite the availability of devices such as screen reader software and text-based communication applications. Employment opportunities remain limited, particularly in private organizations that offer minimal workplace accommodations.

Pruettikomon and Louhapensang (2018) emphasized that workers with physical disabilities encounter mobility issues, such as difficulties in commuting to work, moving across thresholds, and using workstations that are not designed for wheelchair users. For instance, many are unable to fit their wheelchairs under desks or are compelled to transfer to conventional office chairs. Furthermore, insufficient adaptive equipment and assistive technology exacerbate these challenges. In the context of the printing industry, most modern machines are designed without considering accessibility needs, making it difficult for disabled workers to operate equipment, manage printed materials, or handle technical tasks. For example, visually impaired workers may struggle to interpret instructions displayed on digital machine panels, while physically disabled employees may face challenges in reaching or handling controls. Narayanan (2018) also highlighted that PWDs in Malaysia encounter discrimination, inaccessible workplace environments, and limited access to assistive technologies, which further restrict their employment opportunities.

SOCSO statistics (2024) reveal that out of 29,535 job seekers who secured employment, only 717 were from marginalized groups, including persons with disabilities (PWDs). Similarly, only 238 employers received government incentives for hiring 382 individuals from these groups, indicating low employer participation in inclusive hiring. Although 703,671 PWDs are registered in Malaysia, with 372,164 eligible to work, the Government's 1% employment policy target introduced in 2010 remains largely unmet. The main barriers include limited employer awareness, inadequate disability-friendly facilities, and insufficient training to support PWDs in adapting to industry demands. While companies such as Flextronics Sdn Bhd (Penang) have made progress by employing 1.4% PWDs in their workforce, such cases are exceptions rather than the norm. Overall, the literature highlights persistent gaps in employer commitment, workplace accessibility, and effective implementation of inclusive policies, particularly in industrial sectors such as printing. In Malaysia, there is a clear gap between the number of people with disabilities who are registered and those who are working. Figure 1 shows that out of 703,287 registered individuals with disabilities, only 372,164 have jobs. This means more than 331,000 people are not part of the workforce.

Figure 1: Number of Registered Individuals with Disabilities and Their Employment Status



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2.2. Employer Awareness and Barriers to Hiring Disabled Workers

A major barrier to the inclusion of persons with disabilities (PWDs) in the workforce is employers' lack of awareness regarding the need for specialized facilities. Although the government provides incentives, such as a one-time tax deduction for costs incurred in modifying workplace facilities (e.g., accessible toilets and adapted equipment) (Norfatin Nadhiah Rosli, 2021), these measures have had limited impact. Despite Malaysia's ratification of the Convention on the Rights of Persons with Disabilities in 2010 and continued budget allocations to support inclusion, employer participation remains minimal. According the Persons with Disabilities Act 2008 (Act 685), employers are expected to fulfill their social responsibility by assessing PWDs' capabilities, providing accessible workplaces, and ensuring proper employment management. However, the effectiveness of these initiatives is constrained by limited awareness, inadequate training, and weak enforcement. Furthermore, hiring decisions are often influenced by market demands, perceptions of PWDs' capabilities, and doubts about the adequacy of inclusion efforts, thereby restricting workforce participation in industrial sectors.

3. Research Methods

This research employed a mixed-methods approach, combining both quantitative and qualitative techniques. The quantitative component consisted of an online survey, with responses analyzed in percentage form to identify patterns and trends. The study population for the survey comprised printing companies registered under the Persatuan Pengusaha Pencetak Melayu Malaysia (PPPMM), one of the main printing associations in Malaysia. In parallel, the qualitative component involved semi-structured interviews designed to capture in-depth insights into the experiences and perspectives concerning the provision of special facilities for physically disabled workers in the pre-press departments of the printing industry. Respondents for the interviews were purposively selected based on their relevance to the study objectives, ensuring that the data reflected informed and meaningful perspectives.

3.1. Data Collection Method

This research utilized both primary and secondary data. Primary data was obtained directly through the researcher's field experience, while secondary data was collected from online databases to identify the study population and gather basic information regarding the membership of printing companies. The data collection process was conducted in two phases.

Data for Phase 1 was gathered through an online survey targeting Malaysian printing companies. The survey was sent to HR managers of companies registered under the Persatuan Pengusaha Pencetak Melayu Malaysia (PPPMM) to collect information about their employees with disabilities. Closed-ended questions were used to guide respondents, allowing them to select one or more options from a provided list (Jenn, 2006). The survey comprised 18 questions divided into two sections: Part A focused on capturing the demographic and organizational profile of printing companies in Selangor, while Part B gathered information regarding physically disabled employees and the facilities required to support their employment within these companies.

Phase 2 of this study involved an interview session to expand on the information obtained from Phase 1. Four participants from different backgrounds were selected to

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provide their views, namely: a representative of a printing company that employs disabled workers (P1), disabled workers themselves (P2), a representative from the Disability Services and Development Division (P3), and an expert architect (P4). The selection of respondents, printing companies, and disabled workers for this interview session was based on data collected through an online survey during Phase 1. According to Creswell (2022), around four to five respondents are sufficient in a case study. Four respondents were sufficient based on the mixed methods approach used in this study. This study is categorized as a collective or multi-case study because the researcher obtained views from various stakeholders on the same issue. The purpose of this interview session was to identify special needs that need to be provided in the prepress department in the printing industry. An initial draft of the brainstorming results was drafted to formulate a proposal for suitable facilities to achieve the study objectives. This study used a semi-structured interview method, where each participant was given questions tailored to their background. This method allowed the researcher to pose open-ended questions that had been set while giving participants the space to respond flexibly based on their experiences, challenges, needs, and preferences toward the existing facilities and work environment. According to Jamshed (2014), semi-structured and in-depth interviews are an appropriate approach to obtain comprehensive insights, whether individually or in groups. The qualitative phase of this research utilized a diverse group of stakeholders to provide a comprehensive perspective on workplace accessibility. As shown in Table 1, the study included four respondents: a Human Resources Manager (P1), a physically disabled Graphic Designer (P2), a Senior Executive from the Disability Services and Development Division (P3), and a Principal Architect (P4). Table 1 enhances the credibility of the findings by demonstrating that data were collected from managed users, policy experts, and design professionals.

Table 1: List of Interview Respondents

No.	Participant Code	Position	Organization	Specific Role in the Study
1	P1	Human Resources Manager	Printing Company	Acceptance and management of physically disabled workers in the Pre-press department in a printing company.
2	P2	Graphic Designer (Physically Disabled)	Printing Company	Personal experience as a disabled worker in the Pre-press department.
3	P3	Senior Executive	Disability Services and Development Division	Role in developing facilities for the physically disabled staff.
4	P4	Principal Architect	ZMS Architect	Professional views on accessible facility layout design.

3.2. Data Analysis Method

Data collected from fieldwork and online surveys will be analyzed using quantitative and qualitative methods. Quantitative methods use descriptive statistics to summarize and provide a numerical picture (Rana et. al., 2021) of the current employment conditions and facilities for individuals with physical disabilities in the pre-press

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department of the printing industry. The quantitative analysis provides a comprehensive overview of the current employment conditions and facilities for people with physical disabilities in the printing industry. The analyzed data were then presented in tabular format, transcribed from recorded interviews, and organized for analysis. Qualitative data from interviews underwent thematic analysis involving coding, categorization, and interpretation to reveal key themes and patterns. NVivo software was used to facilitate this thematic analysis process. This study seeks opinions to be aggregated and presented qualitatively, using quotes, excerpts, and narratives to identify specific needs based on the study findings. According to Sutton and Austin (2015), the identification of topics, issues, similarities, and differences revealed by the participants' narratives and interpreted by the researcher is called coding.

4. Results

This chapter presents the analysis of data collected through a survey designed to assess the facilities and special needs of physically disabled workers in the pre-press sector of the printing industry. The primary objective of the analysis is to evaluate the availability of accessibility facilities, identify the types of physically disabled employees involved, and examine company attitudes toward hiring individuals with special needs. The findings provide an overview of the sector's current preparedness and commitment to supporting physically disabled workers. In addition to the survey, qualitative data were obtained through semi-structured interviews with four key participants: a human resources manager (P1) and a graphic designer who uses a wheelchair (P2) from a printing company, a senior executive from the Disability Services and Development Division (P3), and an expert architect from ZMS Architect (P4). These interviews offered in-depth insights into policies, workplace experiences, institutional support mechanisms, and professional perspectives on designing accessible facilities for disabled employees in the printing sector. The combination of quantitative and qualitative data in this chapter enriches the discussion on inclusive employment practices and informs recommendations for improving pre-press workplace facilities.

Data collection focused on members of the Persatuan Pengusaha Pencetak Melayu Malaysia (PPPMM), which provided a list of 49 registered companies. Of these, 27 companies operated in Selangor and were selected to evaluate the participation of physically disabled workers and the level of workplace inclusion. Questionnaires were emailed to the human resource departments of these companies, and 21 responses were received. The survey was conducted over a two-month period, from 15 November 2024 to 15 January 2025.

4.1. Workers of Disabled Persons in the Printing Industry

Statistical data from PPPMM members indicate that among 21 printing companies in Selangor, the employment of disabled workers is extremely low, with only one individual currently employed in the Pre-Press Department as a Graphic Designer. Despite this, the study findings reveal that 16 companies expressed willingness to hire disabled workers in the future, depending on their organizational needs and circumstances, as illustrated in Figure 3. This suggests that there is potential to expand employment opportunities for disabled individuals in the printing industry, provided that supportive initiatives and greater employer awareness are implemented. When focusing on the printing sector, the data show that of the 21 companies surveyed, only 1 (4.8%) currently employs a worker with a disability, while the remaining 20 (95.2%)

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have none. Figure 2 visually represents this distribution. Figure 3 indicates that 16 companies are identified as "Ready" or willing to hire disabled employees in the future, compared to 5 companies classified as "Not Ready."

Figure 2: Persons with Disabilities (PWDs) Workers in the Printing Companies

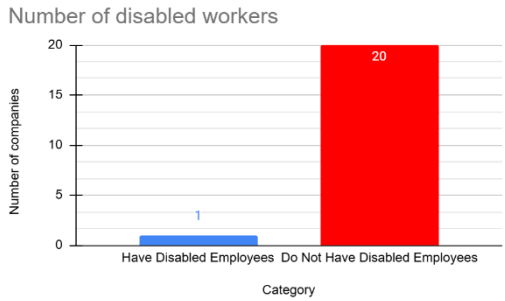

Figure 3: Willingness to Hire Disabled Employees

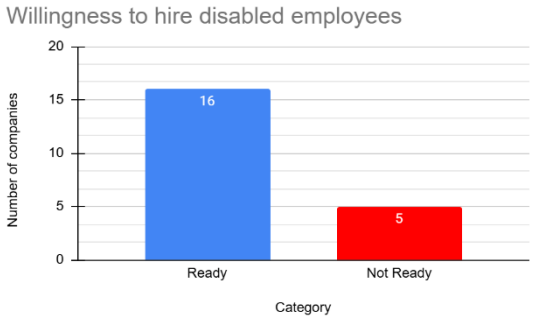

Table 2 provides a summary of quantitative data on persons with disabilities (PWDs) collected through the online survey. Among the companies that reported employing disabled workers, only one company (4.8%) employed a worker with arthritis. No employees were reported in other physical disability categories, such as limb deformities (congenital or acquired), spinal cord injuries, dwarfism, stroke, traumatic brain injury, or cerebral palsy (hemiplegia, diplegia, quadriplegia). Additionally, there were no disabled workers in categories such as hearing, vision, speech, learning, mental, or multiple disabilities. The remaining 20 companies (95.2%) reported not employing any disabled workers. These results indicate that the participation of disabled workers in the printing sector is extremely limited and that the range of physical disabilities represented is very narrow. This suggests a significant lack of employment opportunities for individuals with diverse disabilities, despite their potential contributions to the industry. The findings underscore the need to raise awareness and encourage employer participation to provide equitable opportunities for people across various categories of physical disabilities in the printing sector.

Table 2: Information for Disabled Workers

Attribute	Number	Percentage (%)
1. Does your company have any workers with Persons With Disabilities (PWD)?		
(i) Yes	1	4.8

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(ii) No	20	95.2
2. Number of Persons With Disabilities (PWD) employees in the company?		
(i) 1-10 employees	1	4.8
(ii) 11-20 employees	0	0
(iii) 21-30 employees	0	0
(iv) More than 30 employees	0	0
(v) Not Related	20	95.2
3. Category of workers with Persons With Disabilities (PWD)		
(i) Physical	1	4.8
(ii) Hearing		0
(iii) Visual	0	0
(iv) Speech	0	0
(v) Learning	0	0
(vi) Mental	0	0
(vii) Multiple	0	0
(viii) Not Related	0	95.2
4. In which departments does your company employ workers with physical disabilities?		
(i) Pre-Press (Graphic Design, DTP, Colour Correction, Quality Control, Pre-Press Operator, CTP)	1	4.8
(ii) Press (Machine Operator, Printing Production, Technician, Offset Operator, Digital Printing Operator)	0	0
(iii) Post-Press (Quality Control, General Worker, Folder Glue Operator Machine, Technician- Binding)	0	0
(iv) Sales/ Marketing	0	0
(v) Not Related	20	95.2
5. If in pre-press, please specify the job positions your company offers to workers with physical disabilities?		
(i) Graphic Designer	1	4.8
(ii) None	20	95.2
6. Which type of workers with physical disabilities in your company?		
(i) Limb Defect (Acquired / Congenital)	0	0
(ii) Spinal Cord Injury	0	0
(iii) Dwarf	0	0
(iv) Stroke	0	0
(v) Traumatic Brain Injury	0	0

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(vi) Cerebral Palsy (Hemiplegia, Diplegia, Quadriplegia)	0	0
(vii) Tidak Berkaitan / Not Related	20	95.2
(viii) Other (Arthritis)	1	4.8

Table 2 shows that the involvement of physically disabled workers in the printing sector is minimal, especially in departments other than prepress. In addition, it was found that the positions offered to physically disabled workers in the pre-press department only focused on graphic design tasks. This situation is likely due to the suitability of the work tasks given to them with their abilities as physically disabled, compared to tasks in other departments. Table 2 summarizes the primary quantitative data regarding the employment status of persons with disabilities (PWDs) in the printing sector. Among the surveyed companies, 95.2% do not employ any PWDs. In the 4.8% of companies that do, employment is confined to the Pre-Press department, specifically within Graphic Design roles. Furthermore, the data indicate minimal diversity in reported disability types, with "Arthritis" being the sole physical condition identified.

4.2. Provision of Facility Requirements in the Printing Industry

Table 3 presents data on the basic facilities available for physically disabled workers in the workplace. The analysis covers five key areas: general accessibility features, accessible toilets, lifts, furniture and desk arrangements, and ramp pathways. The findings are based on feedback from the 21 companies that responded to the survey. Table 3 indicates a significant shortage of physical aids, as 86% of employers lack both elevators and ramps. These data quantitatively demonstrate that the current physical infrastructure of the printing industry is inadequate to support workers with mobility impairments.

Table 3: Provision of an Inclusive Company Environment for Employees with Physical Disabilities

Attribute	Number	Percentage (%)
1. Does your company provide adequate access facilities for workers with physical disabilities?		
(i) Yes	3	14
(ii) No	9	42
(iii) Not Sure	9	42
2. Are there facilities suitable for workers with physical disabilities, such as accessible toilets?		
(i) Yes	4	19
(ii) No	11	52
(iii) Not Sure	6	29
3. Are there elevators that make it easier for workers with physical disabilities to move around in the company building?		
(i) Yes	3	14
(ii) No	18	86

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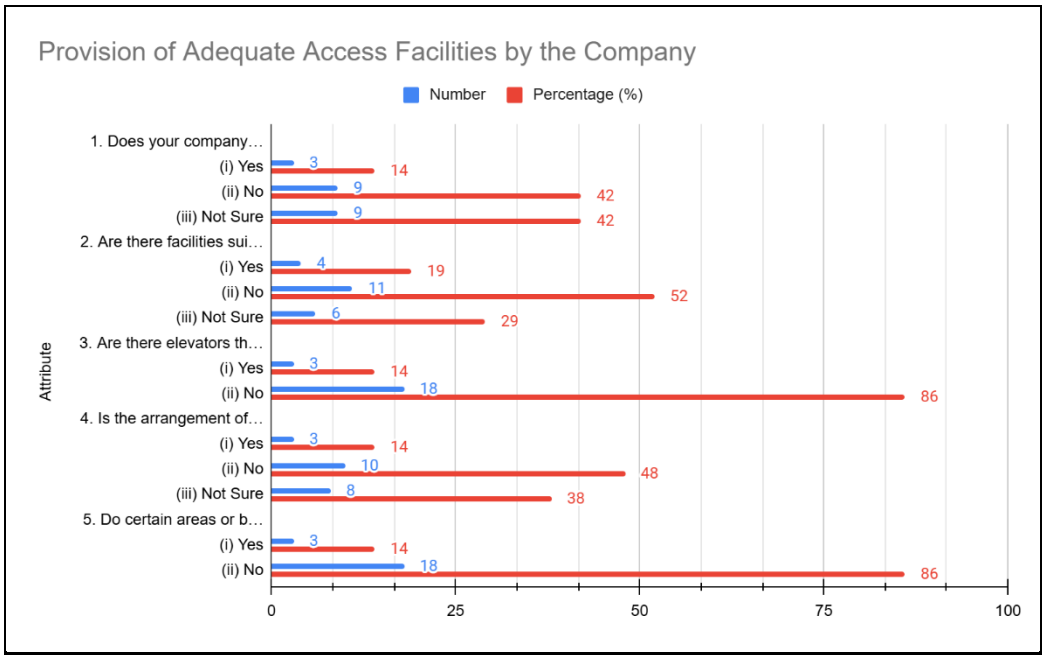
4. Is the arrangement of furniture and desks suitable for workers with physical disabilities?		
(i) Yes	3	14
(ii) No	10	48
(iii) Not Sure	8	38
5. Do certain areas or buildings have ramps to facilitate movement for workers with physical disabilities?		
(i) Yes	3	14
(ii) No	18	86

Figure 4: Provision of an Inclusive Company Environment for Employees with Physical Disabilities



The assessment of existing infrastructure identifies the primary reason for low participation of persons with disabilities (PWD). Figure 4 presents a comprehensive analysis of five key accessibility attributes: general access, toilets, elevators, furniture arrangement, and ramps. The data indicate that 86% of companies lack ramps or elevators, and 52% lack accessible toilets. These findings clarify why the willingness to hire, as discussed in previous sections, does not result in increased employment. The physical environment remains fundamentally inaccessible for individuals with mobility impairments. Based on the data obtained, the analysis shows that most companies still do not provide adequate general facilities to accommodate the needs of workers with physical disabilities. Only 3 companies (14%) reported providing adequate accessibility facilities, while 9 companies (42%) stated that they did not provide such facilities, and the remaining 9 companies (42%) were unsure about the availability of such facilities. This indicates that providing accessibility for physically disabled employees is not a priority in most companies. This situation is also reflected in the aspect of special facilities such as accessible toilets. Showing a serious imbalance in the provision of facilities for physically disabled workers. Only 19% of companies provide disability-friendly restrooms, reflecting a lack of attention to accessibility for disabled workers in

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the workplace. Meanwhile, 52% of companies do not provide this facility, indicating that more than half of the companies have not prioritized the provision of suitable toilets for disabled employees. Additionally, 29% of companies are uncertain about the availability of such facilities, which further raises doubts about their level of awareness and commitment to the welfare rights of disabled employees. This situation raises serious questions about the extent to which employers pay attention to the basic needs of physically disabled employees, particularly in providing adequate and safe basic facilities for them.

Of the 21 companies responding to the study, the analysis shows that facilities to facilitate the movement of physically disabled workers in the workplace are still limited. First, regarding the availability of elevators to facilitate the movement of physically disabled employees in multi-story buildings, only 3 companies (14%) reported having elevators that facilitate the movement of these employees, while 18 companies (86%) do not provide this facility. This indicates that most companies operate in buildings that only have two floors, where the high cost of building an elevator may be a hindrance. Therefore, most companies do not pay sufficient attention to the needs of physically disabled employees, especially in providing the necessary access facilities. Secondly, in terms of furniture and desk arrangement, only 3 companies (14%) reported a workplace layout suitable for physically disabled employees, while 10 companies (48%) stated that the arrangement was unsuitable, and 8 companies (38%) were unsure about it. This situation indicates that most companies do not pay enough attention to creating a workplace layout that is friendly to people with disabilities, which could potentially affect the comfort and effectiveness of physically disabled employees in performing their tasks. Finally, in the provision of ramp access, only 3 companies (14%) provide this facility, while 18 companies (86%) do not provide ramps to facilitate the movement of physically disabled employees. This shows that most companies do not prioritize easy and comfortable physical access for these workers, especially those who use wheelchairs. This situation reflects a lack of attention to the basic needs of physically disabled employees in the workplace. Overall, this data reflects that most companies still fail to provide adequate facilities for physically disabled workers, which raises concerns about employers' indifference to the basic needs of disabled workers in the workplace.

4.3. Accessibility in the Pre-Press Department

To gain deeper insights into the facilities and specific needs of physically disabled workers in the printing industry, several key stakeholders were interviewed. The interviews involved four respondents (P1, P2, P3, and P4) and provided valuable information regarding company policies on accessibility, challenges encountered, and recommendations for enhancing workspace design and institutional support. Accessibility in the workplace, particularly in the pre-press department, is essential to ensuring the effective and productive participation of persons with disabilities (PWDs). As highlighted by Alexander et al. (2024), individuals with disabilities continue to face significant barriers in securing suitable employment, while Hashim et al. (2020) stressed the importance of providing equitable access to all facilities to promote equal opportunities. Within the printing industry, this is especially crucial as the work often involves operating machines and monitoring printing processes. This case study examines a company’s efforts to improve accessibility for physically disabled employees, based on stakeholder interviews. Findings indicate a positive commitment from three respondents (P1, P3, and P4) toward implementing accessible and disability-friendly facilities in the workplace.

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4.4. Pre-Press Department Workspace

The arrangement of furniture in the workspace is a crucial factor that management considers in fostering a more inclusive work environment. Providing wider and more comfortable spaces is particularly important for employees who use wheelchairs or have other physical limitations, as it facilitates safe and efficient movement. According to P1, the company has allocated larger workspaces on the ground floor to ensure that employees with disabilities can access and navigate the work area with greater ease. This initiative was also supported by P3, who noted that, in the past, some employees had been placed on the third or fourth floors, which were only accessible by stairs. To address this issue, the company relocated disabled employees to the ground floor, thereby improving mobility and accessibility. Another strategy highlighted by P1 was the reduction of printing machines in the workspace, which not only minimized congestion but also created wider pathways for employees with disabilities to move around. P3 further emphasized that assigning employees to workspaces that correspond with their level of mobility is vital in ensuring both comfort and productivity in daily tasks. Similarly, P2 stressed the importance of reorganizing office furniture and equipment placement to guarantee sufficient and accessible pathways for physically disabled workers. These findings are consistent with the literature, where Kim et al. (2020) highlighted workplace modifications—such as wider pathways—as essential in addressing mobility challenges. The World Health Organization (2021) also recognized physical accessibility as a fundamental component of creating disability-friendly work environments. When workers with disabilities encounter difficulties in movement or access, it not only hampers productivity but can also compromise safety and negatively impact emotional well-being.

4.5. Support Equipment for Designers with Physical Disabilities

In the pre-press department of a printing company, the availability of suitable equipment and accessible facilities is crucial to enable physically disabled workers to carry out their tasks effectively, safely, and with greater comfort. Among the main equipment used is a high-performance graphics computer that supports various design software such as Adobe Illustrator, InDesign, and Photoshop. The company shows a strong commitment to creating an inclusive work environment by considering the physical needs of disabled workers. As a technology support initiative, the company provides laptop loan facilities for workers who have problems with their equipment (P1). According to Pruettikomon and Louhapensang (2018), the provision of appropriate equipment and facilities is one of the key elements in supporting the effectiveness of the work of individuals with disabilities. In addition, management also plays an important role in facilitating technical communication, for example, through sharing temporary emails and passwords to enable disabled workers to access the system and send design files to the design team in the office without any technical barriers (P1). Although the use of specialized assistive technology, such as adaptive devices, is still minimal, the provision of appropriate equipment and ongoing technological support is an important step in ensuring that physically disabled workers can perform their tasks effectively and productively in the pre-press department work environment. From a policy perspective, the Persons with Disabilities Act 2008 (Act 685) emphasizes that both the government and private sectors are responsible for providing appropriate facilities and infrastructure to meet the needs of persons with disabilities.

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4.6. Furniture Arrangement

The arrangement of furniture in the workspace for physically disabled employees within the printing industry must be carefully designed to enhance mobility, safety, and work efficiency. In pre-press departments, where tasks typically involve the use of computers, digital equipment, and frequent movement between desks, shelves, and printing presses, spatial planning becomes particularly important. As highlighted by P3, additional facilities such as ramps, ergonomic desks, and specialized chairs have been introduced to support both the comfort and functional needs of workers with disabilities. Feedback from management further reflects a strong commitment to creating inclusive workspace layouts. P2 emphasized the importance of reorganizing furniture and machinery to provide wider passageways, ensuring easier access and smoother movement for physically disabled employees. This aligns with recommendations by Pruettikomon and Louhapensang (2018), who suggest the integration of adjustable desks and cabinets, easily accessible storage units, and the placement of switches and sockets within the reach of wheelchair users. They also stress the need to account for the turning radius of wheelchairs when planning office layouts, thereby ensuring that employees can maneuver without facing unnecessary barriers.

4.7. Door Widths

The width of doors in the workplace is a fundamental component in ensuring comprehensive physical accessibility for physically disabled workers. In the context of the printing industry, especially in the pre-press department, which involves movement between office spaces, storage of printed materials, and design machines, the dimensions and layout of doors need to comply with accessibility standards. Responses from respondents indicated that office spaces equipped with adequately sized doors do not pose any problems in terms of movement for disabled workers (P1). All doors, including doors to workrooms, are designed with an appropriate width to allow wheelchair access without any obstacles. Management also emphasized the importance of taking accurate measurements so that the door size meets the practical needs of wheelchair users and is not based on a mere estimate (P4). The MS 1184:2002 standard stipulates that every public building must provide an entrance with an opening suitable for wheelchair users. Insufficient door width can impair mobility, increase the risk of injury, and create dependence on assistance from others. Therefore, widening doors or using disabled-friendly designs such as automatic doors or sliding doors are also among the measures that can be considered. A study by Kim et al. (2020) emphasizes that workplace modifications to accommodate the needs of physically disabled workers need to focus on basic elements such as adequate entrance space and doors.

4.8. Ramps

Ramps represent one of the fundamental elements in ensuring safe and comfortable physical access for physically disabled workers, particularly those who use wheelchairs. Movement between office spaces, pre-press departments, and storage areas requires either a flat surface or a gradient with an appropriate slope to eliminate obstacles that may restrict mobility. The provision of ramps is consistent with the requirements of MS 1184:2002, which specifies that, in addition to stairs, accessible ramps or lifts or both must be provided to ensure vertical accessibility for all persons with disabilities (Clauses 5 and 10). In line with these standards, P4 emphasized that ramps should be installed in all areas where physical barriers exist, thereby ensuring inclusivity in

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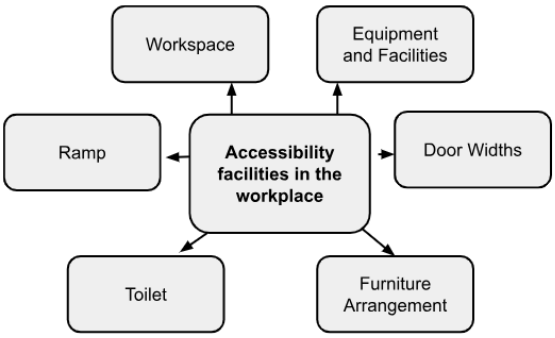
workplace design. The study findings revealed that participants were generally satisfied with the ramp facilities provided at the company's premises. According to P2, ramps have been installed at several main entrances, allowing wheelchair users to move independently without having to rely on assistance. This highlights the crucial role of ramps in supporting the autonomy and daily mobility of disabled employees. Similarly, P3 noted that whenever employees who use wheelchairs are recruited, the company ensures that all necessary facilities, including ramps, are adequately provided to meet their accessibility needs.

4.9. Use of Toilets for Physically Disabled Workers

Toilets are essential basic facilities in the workplace to meet the hygiene and comfort needs of all employees. In the printing industry, accessible toilet facilities are a fundamental requirement for maintaining employee well-being. However, for physically disabled employees, the requirements for these facilities are more specific and must meet the accessibility features set by national standards. The results of the study interviews showed that several organizations have taken proactive steps to meet these needs. For example, P1 stated that the company has provided spacious toilets that are accessible to wheelchair users and have been used by disabled employees in the past. This statement is supported by the findings of Poernomo et al. (2022), which demonstrate that the company is making efforts to meet the needs of disabled employees, particularly in terms of facilities and infrastructure, including the provision of special toilets for individuals with disabilities. Furthermore, according to the P1, accessible toilets are the only special facilities provided for wheelchair users. This is in line with Malaysian Standard MS 1184:2014, which stipulates that buildings such as hotels, workplaces, public buildings, as well as sports and recreational facilities must be equipped with accessible toilet facilities for people with disabilities. To address these shortcomings, this study introduces a structured approach to inclusivity. Figure 5 presents a conceptual framework for Accessibility and Facilities in the Pre-Press Department. The flow diagram identifies six critical pillars: workspace, equipment, door widths, furniture arrangement, toilets, and ramps. Addressing these pillars collectively establishes a functional environment. Figure 5 visually summarizes the study's recommendations, highlighting that accessibility results from a comprehensive redesign of the pre-press ecosystem rather than isolated modifications.

Figure 5: Accessibility and Facilities in the Pre-Press Department



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4.10. Special Requirements According to Standards in the Pre-Press Department

Based on the findings derived from expert interviews and survey responses, it was evident that most printing companies have yet to implement facility layouts that adequately meet the actual needs of physically disabled workers (PWDs). To address this gap, it is essential to propose facility requirements that align with recognized standards and serve as a practical reference for the printing industry, particularly in the pre-press department. The proposed requirements are guided by the principles of Universal Design and the MS 1184:2014 standard, which emphasize accessibility for PWDs within the built environment. These recommendations incorporate feedback from professional architects, the Disability Services and Development Division, as well as insights from key stakeholders. For instance, P3 and P4 underscored the importance of ensuring continuous accessibility by providing ramps, wider doorways, and barrier-free pathways, while P1 and P2 highlighted the need for reorganizing machinery and furniture to create sufficient passage space and improve mobility. Beyond structural elements such as doors, corridors, and PWD-friendly toilets, the proposed measures also consider workspace layout, ergonomic comfort for wheelchair users, and strategic workstation placement to support daily access and ensure safety in emergency situations. Through these proposed requirements, printing companies are encouraged to redesign and upgrade their facilities in ways that foster inclusivity and create a more disability-friendly work environment. To address the accessibility gap, this study synthesizes expert feedback and national standards to develop actionable guidelines. Table 4, titled "Suggested Elements in the Pre-Press Department," provides precise technical specifications. For example, Table 4 recommends a minimum workspace width of 900 mm and a desk height between 740 mm and 800 mm to accommodate wheelchair users. Referencing Table 4, the study transitions from problem identification to offering a practical blueprint for printing companies to align their facilities with MS 1184:2014 standards.

Table 4: Suggested Elements in the Pre-Press Department

Elements	Suggestions	Reference / Validation
Workspace	Minimum width 900mm, minimum obstacle-free passage 1500 mm	MS 1184:2014, P4
Furniture/Desk	Desk level 740 mm to 800 mm from the floor. Clear knee space should be a minimum of 700 mm. Ergonomic furniture and moving furniture or equipment that obstructs the path	P2, P3, P4
Workstation	Provide a comfortable workplace, or on the ground floor if it is difficult to get upstairs.	P1, P2, P3
Ramp	Ramp gradient 1:12, minimum width 900mm	MS 1184:2014, P4
Width Door	The width of the entrance door is at least 900 mm to 1000 mm to allow users to move in without obstacles	MS 1184:2014, P4
Toilet	The minimum size of the toilet space is 2200 mm x 2200 mm. Space with a minimum radius of 1500 mm.	MS 1184:2014, P4

The results of the interviews in this study showed that the planning of the workspace in the prepress department should take into account the main requirements, such as easy access, more space, and the removal of physical barriers to enable physically disabled workers to perform their tasks efficiently and safely. According to one of the respondents

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(P2), the layout of furniture and machines should be rearranged so that the passage is wider and more user-friendly, while P4 emphasized that the design of the workspace should not only meet the minimum requirements but also be practical and comfortable for daily use. The passage between workstations should be at least 900 mm wide with a minimum turning radius of 1500 mm, as in MS 1184:2014. In the context of furniture, the provision of height-adjustable workbenches is important to ensure suitability for the physical needs of individuals, especially wheelchair users. The ideal workbench should be between 740 mm to 800 mm high from the floor level, with a minimum free space of 700 mm under the table to allow for comfortable movement and correct working posture. Workstation placement also plays a key role in supporting the work performance of physically disabled workers, and some organisations are taking proactive steps by placing disabled workers on the ground floor or in larger office spaces to make them more accessible. In terms of furniture layout, it should be free from physical barriers, with printed materials and equipment neatly arranged in a place that does not interfere with the daily movement of wheelchair users. The selection of work tables should also meet ergonomic features and be adjustable to meet individual needs. For printing companies with differences in level between work zones, the provision of ramps that comply with the MS 1184:2014 standard is very important, including a gradient of 1:12 and a minimum width of 900 mm to facilitate the safe movement of wheelchair users. In addition, all doors, including main doors and internal doors, must have a minimum opening of 850 mm, with a preference of 900 mm or more, so that access in and out can be carried out without obstacles. Toilet spaces should also be designed to be disability-friendly, with a minimum size of 2200 mm x 2200 mm and a 1500 mm turning space inside, doors that open outwards, and proper equipment layout to ensure user safety and comfort. Therefore, all these features not only meet technical standards and legal requirements but also reflect the organization's commitment to supporting the inclusion, welfare and well-being of physically disabled workers in the printing industry.

5. Conclusion

This study comprehensively explored the challenges and opportunities in creating an inclusive work environment for physically disabled workers in the printing sector in Malaysia, with a specific focus on the pre-press department. The findings revealed that the participation of disabled workers remains extremely limited, with only one individual employed across 21 surveyed printing companies in Selangor. This highlights a significant employment gap for persons with disabilities (PWDs), despite their potential contributions to the sector. A key barrier identified was the lack of adequate disabled-friendly facilities, compounded by low employer awareness. The majority of companies reported not providing essential accessibility features such as suitable toilets (52%), lifts (86%), ergonomic furniture and desk arrangements (48%), and ramps (86%). This indicates that accessibility has yet to be prioritized within most printing organizations. Nevertheless, the study also found encouraging signs, as 16 of the 21 companies expressed willingness to employ PWDs in the future, depending on organizational needs and capacity. Positive initiatives were observed among certain companies and the Disability Services and Development Division, which have introduced measures such as workspace adaptations and provision of supportive equipment. Professional insights, particularly from expert architects, reinforced the importance of PWD-friendly facilities, recommending practical solutions such as height-adjustable desks, wider workspaces to accommodate wheelchair mobility, and access to appropriate technological tools like laptops. The study also highlighted the relevance of MS 1184:2014, which provides technical guidelines on door width, wheelchair turning space, and ramp specifications,

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ensuring compliance with universal design principles and barrier-free access. The integration of such standards reflects growing organizational awareness and readiness to create inclusive and disability-friendly workplaces. Overall, the findings underscore the urgent need to enhance awareness and strengthen the implementation of accessibility measures to promote greater participation and productivity of physically disabled workers in the printing sector.

Ethics Approval and Consent to Participate

The researchers used the research ethics provided by the Research Ethics Committee of Universiti Teknologi MARA (REC/07/2024 (PG/MR/353)). All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional research committee. Informed consent was obtained from all participants according to the Declaration of Helsinki.

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Conflict of Interest

The authors reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

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