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Awareness of *PhyMill* treatment for cerebral palsy kids among university students' perspective

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ABSTRACT

Cerebral palsy (CP) is a group of disorders that affect their mobility. This health condition is somewhat of a crucial disability and requires treatment to have a better lifestyle as they grow older. It is important to acknowledge the existence of this condition and ways to battle or treat it. Currently, the physio-treadmill (*PhyMill*) is well developed for CP kids. In this study, we focus on a quantitative survey that was conducted to predictors of the knowledge towards CP and *PhyMill* among university students, and to observe the awareness of the treatment based on ergonomics, biomechanics, and safety aspects using the *PhyMill*. A total of 52 respondents answered the questionnaire, 90% knew the definition of CP, 81% were aware that CP kids need help and support from parents and 67% were aware that CP was incurable. Respondent realizes the function of the *PhyMill*, 94% agreed with the use of *PhyMill* at home. The responsive feedback of *PhyMill* on ergonomics, biomechanics, and safety aspects revealed that it was comfortable, user-friendly, and a good safety invention. The significance of this study was to explore the feasibility of *PhyMill* to enhance the performance of patient treatment in the community.

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1. INTRODUCTION

Cerebral palsy (CP) refers to several issues that make it difficult to walk, maintain their posture, or balance themselves. CP is a form of motor disability that affects children. CP is brought on by a defect in the brain's growth or an injury to the brain that hinders a person's capacity to control the muscles in their body [1]–[3]. The symptoms of CP might vary widely from person to person [4]–[7]. A person who has severe CP may require specialized equipment to walk, or they may be unable to walk at all and require care for the rest of their lives. A person who has CP of mild severity, on the other hand, might walk awkwardly but might not require any assistance. The severity of CP does not often deteriorate over time, although a person's particular symptoms may change at different points in their life [8]. CP prevalence estimates range from 1.5 to over 4 per thousand live births or children of school age in population-based studies conducted around the world [9], [10]–[12]. Males account for 53% of individuals suffering from CP. The majority of the population is Malay, which

accounts for 88% of the total, followed by Chinese and then other races. The Gross Motor Function Classification System (GMFCS) is a five-level worldwide classification system that categorizes children with CP based on their capacity to propel themselves and their need for assistive technology and wheeled mobility [13]–[15]. A diagnosis of CP is a distressing occurrence for any parent, and this circumstance may cause the parents to exhibit negative emotions such as anger and despair, as well as avoidance of caregiving responsibilities and unrealistic expectations of their child [16]. Children who have spastic CP suffer from elevated muscle tone, paresis, and involuntary motor control [17]–[19]. Additionally, these children frequently struggle to keep their balance when standing in an upright position, which requires a high center of mass and a limited support base [20]. A variant state of CP in general agreement in terms of types of impairments, etiology, and severity. Comorbidities reported contain 30-65% in disability of intellectual, 30-5 50% of disorders of seizure, 40% of language and speech deficits, and also in impairments of visual then 5-15% in problems of hearing patients [21]–[23]. The terms that do not primarily affect posture and movement which are disabilities of neuro development not considered as CP and at the same time CP also is not considered for those children who have no signs of motor and have non-progressive terms [24]. Most recently, several researchers have successfully developed Physio-Treadmill (*PhyMill*) products to improve the treatment of CP children in Malaysia. The use of *PhyMill* was found to be very effective in helping the treatment of CP children in the therapy center as well as easing the workload of physiotherapists in daily treatment. *PhyMill*'s main function is to help CP children walk, especially therapy on the lower extremities of their bodies. The design and use of *PhyMill* prioritizes user safety and comfort, taking into account the specific needs and limitations of individuals with motor disabilities. Extensive research and testing have been conducted to ensure the effectiveness and suitability of *PhyMill* in supporting therapeutic interventions. The level of user understanding of devices related to CP children is too limited. Through the review that has been made, it was found that the knowledge of users or parents on several aspects such as information about cerebral palsy patients, ergonomics, biomechanics, safety, and *PhyMill* is very inadequate. This makes it difficult for the physiotherapist to manage the schedule or therapy session with these CP children because the patient is completely dependent on the physiotherapist who is at the therapy treatment center.

There have been many studies investigating the knowledge of healthcare professionals about medical equipment for CP kids, however, research concentrating on young adults is inadequate [25]. This study aimed to explore the perceptions of university students as future parents towards CP and *PhyMill*, in terms of their awareness and knowledge. The objectives were to observe the responsive feedback of the treatment based on ergonomics, biomechanics, and safety aspects using the *PhyMill*. Researchers and public health experts will be able to use the study's findings and insights to better promote and continue research into CP treatments for children in Malaysia.

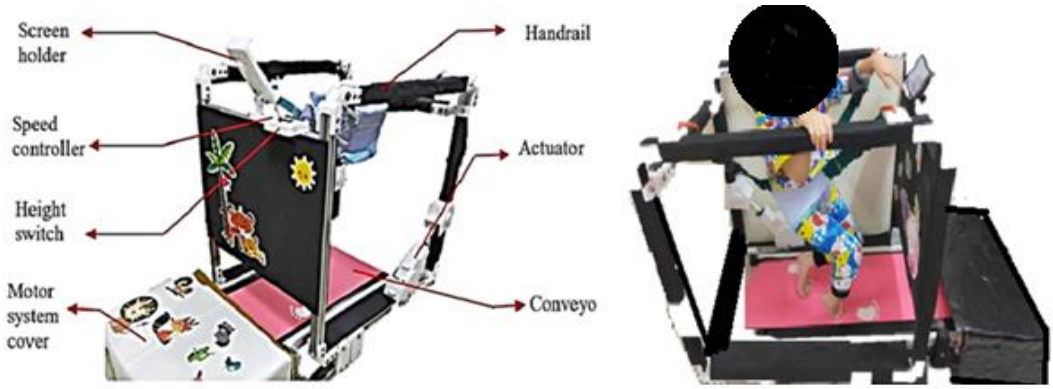


Figure 1. Demonstrated the cerebral palsy kid training using *PhyMill*

2. METHOD

Ergonomics, biomechanics, and safety all play important parts in enhancing labor efficiency and productivity. This is accomplished by tailoring the tool or equipment to the needs of the users while also taking into account the efficiency of the worker [26]. Due to that, the physiotherapy treadmill so-called *PhyMill* is well developed for kids with cerebral palsy [27]. *PhyMill* is one of the developments of supporting technology solutions that aid therapists in helping patients' rehabilitation during physiotherapy sessions, particularly with lower limb movement or lower body components [23], [28]. A rehabilitation center isn't necessary with this

equipment because treatment activities can be performed anywhere, even at home. The *PhyMill*, shown in Figure 1, is designed to simulate the motion of walking repeatedly for children who have cerebral palsy.

2.1. Design Study

This quantitative research method was used in the present research. The study focused on the perception of university students on the awareness and knowledge of the impact of the *PhyMill* treatment for CP based on biomechanics, ergonomics, and safety aspects.

2.2. Data Collection

The major data-gathering instrument was a questionnaire. This survey was carried out for almost three months to accept responses from Universiti Malaysia Pahang (UMP) students. The questionnaires are divided into three (3) sections: Part A, B, and C. Part A are for responders' general information and demographic questions. Part B focuses on the understanding of CP and awareness and knowledge concepts, while Part C focuses on the respondents' comments on the responsive feedback of *PhyMill* treatment on ergonomics, biomechanics, and safety. In pursuit of this objective, a multitude of questionnaire designs derived from prior research were examined, and the majority of variables referenced in those studies were copied directly into the questionnaire for the current study [29]–[33]. The results from the survey were then analyzed to generate graphs. The patterns and trends of graphs were interpreted based on the respondents' opinions. The data is collected through online surveys made with Google Forms. The questionnaires were then distributed to the targeted respondents via the members of this group's social media profiles. The calculation of the sample size reveals that the minimum number of respondents required to obtain a confidence level of 95% with a margin of error of less than 5%.

3. RESULTS AND DISCUSSION

3.1. Demographic data

Figure 2 shows the demographic data analysis of the respondents from this survey. It should be noted that the respondents for this survey were only UMP students of all years. Furthermore, most of the respondents for this survey consisted of main students who are in the 4th year of studies relative to the other year of studies. The local respondents made up 85% of the total respondents and the remaining 15% are international respondents.

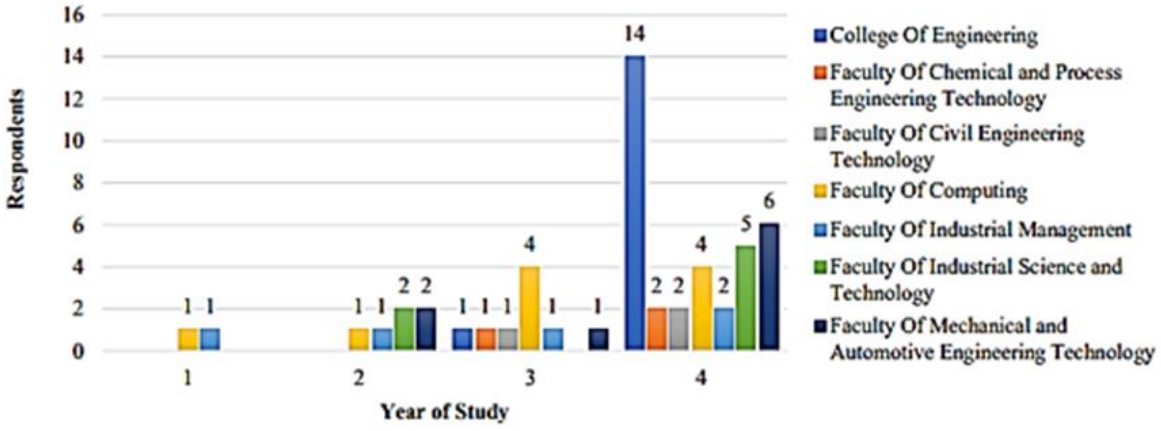
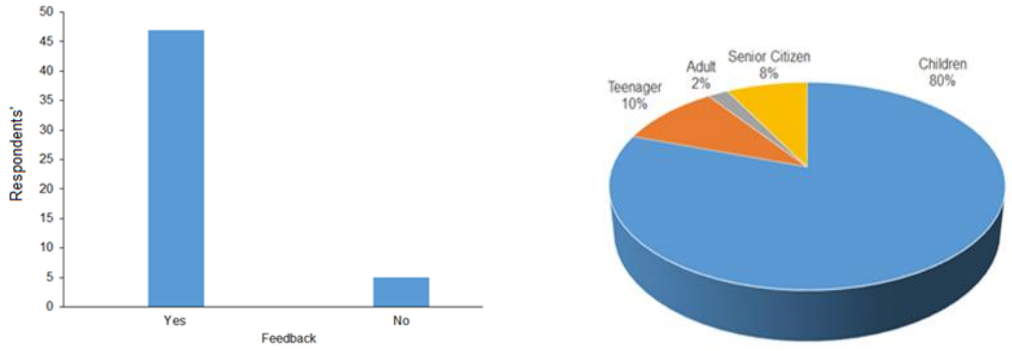


Figure 2. Faculty and year of respondent's study

3.2. Knowledge of cerebral palsy

As it had received over 90% of replies for the given definition, the word "cerebral palsy or CP" is probably already familiar to the majority of the respondents who took the survey. On the other hand, contrary to what is presented in Figure 3(a), more than ninety percent of respondents (47 out of 52) disagreed with the notion that CP is a genetically linked disease. Usually, this CP is detected as early as children where they face difficulty in balancing their body and then walking on their own. These CP children need help or support from their parents to fully help them walk. When compared to teenagers, adults, and senior people, the prevalence of CP is significantly higher among youngsters, as shown in Figure 3(b), which reveals that 81% of respondents

provided this information. In addition, around 67% of those who participated in the survey know that CP is an incurable condition. Therefore, increasing the understanding of these CP patients, especially those who have family members facing CP, need to be sensitive and knowledgeable in handling and helping to treat these CP patients.

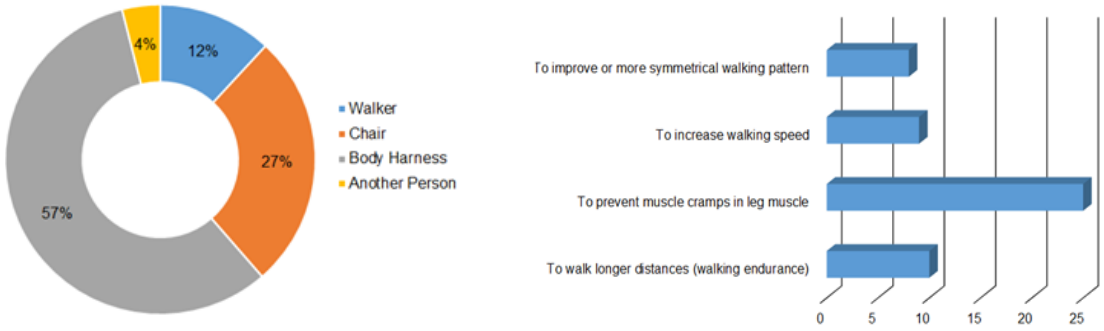


(a) (b)

Figure 3. (a) Represented cerebral palsy is not hereditary, (b) the age group associated with cerebral palsy

3.3. Knowledge of *PhyMill*

Figure 4(a) shows the support component used in a *PhyMill*. About 58% of the respondents show the main support for the CP patient on the *PhyMill* is the harness whereas 27% have mentioned that a chair is used as the support in a *PhyMill*. In Figure 4(b), the respondents understand very well the concept and objective of *PhyMill* training. This is because almost half of the respondents are aware that the *PhyMill* purposely developed is not responsible for preventing muscle cramps but for improving walking distance, walking speed, and walking pattern. Moreover, about 94% of the respondents have agreed that the *PhyMill* training is possible to be conducted at home as well.



(a) (b)

Figure 4. (a) Expressions on the support component in *PhyMill* and (b) the objective of *PhyMill* training

3.4. Responsive feedback to ergonomics aspect

The respondents are shown in Figure 5(a) and Figure 5(b), respectively, when asked about the level of comfort provided by the harness and the positioning of the grips and handles. In total, 52 people were polled, and approximately 20 of them gave a positive response to the question of whether or not the harness was comfortable. The comfortable requirement of the harness on this *PhyMill* product is very important as the user is a child. Seven of the responders, on the other hand, think that the harness is not comfortable. These people need really good comfort, especially when conducting a therapy session where uncomfortable conditions can affect the duration of the therapy and cause disruption and loss of concentration during the therapy session. For this reason, ergonomic evaluation in product development is very important. The suitability, ease of use of the *PhyMill*, and the position of the body posture while using the *PhyMill* are highly emphasized in the ergonomic assessment. Failure to comply with the ergonomic characteristics of the product will cause the product to fail

and may cause harm to the user. Regarding the question of where the grip should be located, approximately half of those who participated in the survey thought it was an appropriate spot. Figure 5(c) illustrates how applicable *PhyMill* training is to real-world scenarios through the use of a sustainability metric. The category with the biggest number of replies is the one labeled "Strongly Agree," which indicates that respondents are in full agreement that *PhyMill* training has a beneficial effect on CP patients in their everyday lives.

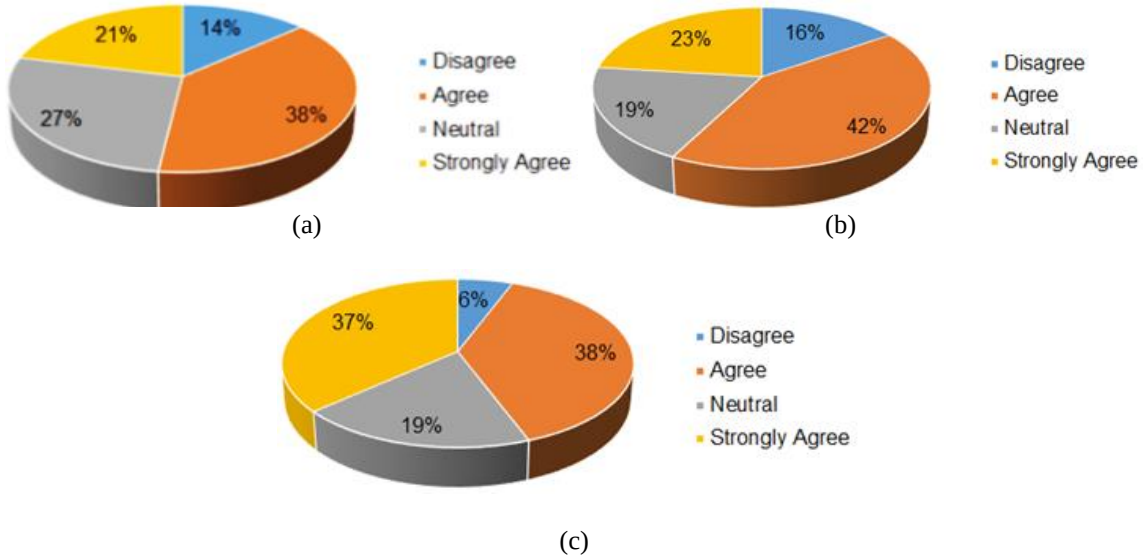


Figure 5. (a) Illustrated the respondents' opinion on harness comfort, (b) Respondents' opinion on handrail comfort, and (c) Respondents' opinion on the sustainability of *PhyMill* training

3.5. Responsive feedback to biomechanics aspect

Figure 6(a) shows the respondents' opinion on the ability of the *PhyMill* training to improve the walking gait and balance of the CP patients. Almost half of the respondents agreed with the effectiveness of the *PhyMill* training to help CP patients improve their mobility. Figure 6(b) shows that the majority of respondents agree that the *PhyMill* training is better than surgical and medication methods for patient treatment. However, an intermediate number of respondents are fairly neutral about this opinion. Figure 6(c) shows the level of user-friendliness of the *PhyMill* training for CP patients. About 38 out of 52 respondents have agreed that the *PhyMill* training is practical to be used by all the children who are diagnosed with CP. The biomechanics aspect is also important in the development of products related to CP children. Aspects of biomechanics such as body balance, human anatomy, structure, function, and movement of mechanical aspects of biological systems, at any level of the whole organism and cell organ, which use mechanical methods should be prioritized.

3.6. Responsive feedback on the safety aspect

Figure 7(a) shows the respondents' opinions on the safety of the harness. Most of the respondents have reacted neutrally to this issue. Almost 30% of the respondents agreed that the harness was comfortable. In Figure 7(b), most of the respondents agree the walking belt of the *PhyMill* is safe and durable to use. Figure 7(c) shows the respondents' opinion on the safety aspect of the *PhyMill* equipment itself. From here, the respondents have mostly agreed that the mechanical components of the *PhyMill* are secured. However, about 15% of respondents disagree regarding this issue and feel not as safe as CP training equipment.

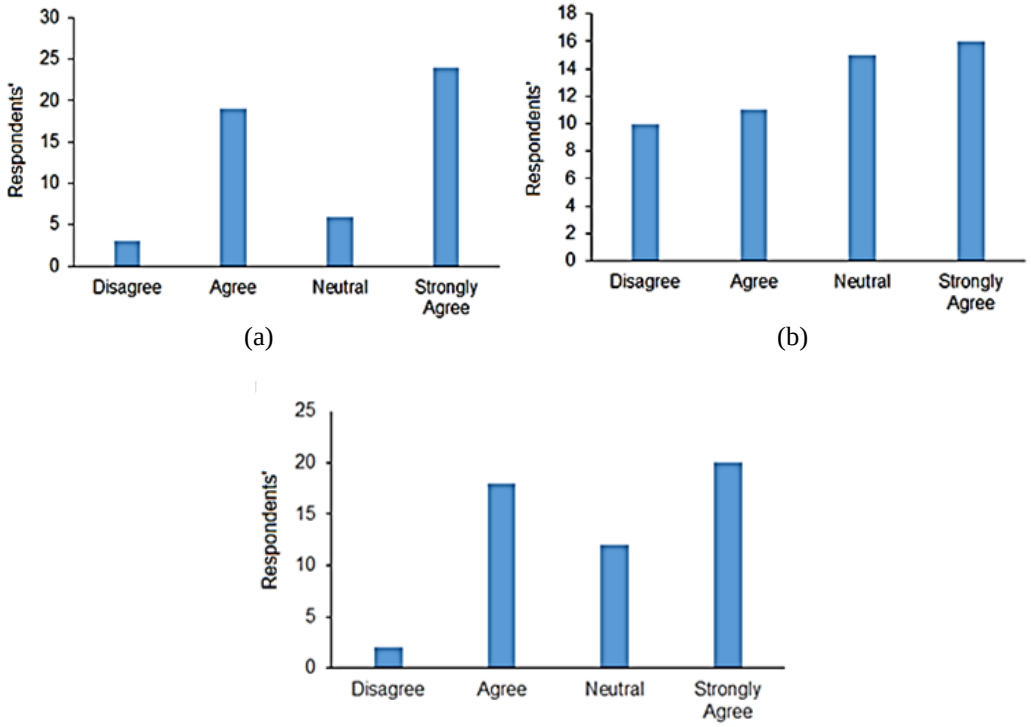


Figure 6. Respondents' opinion on; (i) the improvement of *PhyMill* training, (ii) the comparison between *PhyMill* training to medication and surgery treatment, and (iii) the user-friendliness of *PhyMill* training

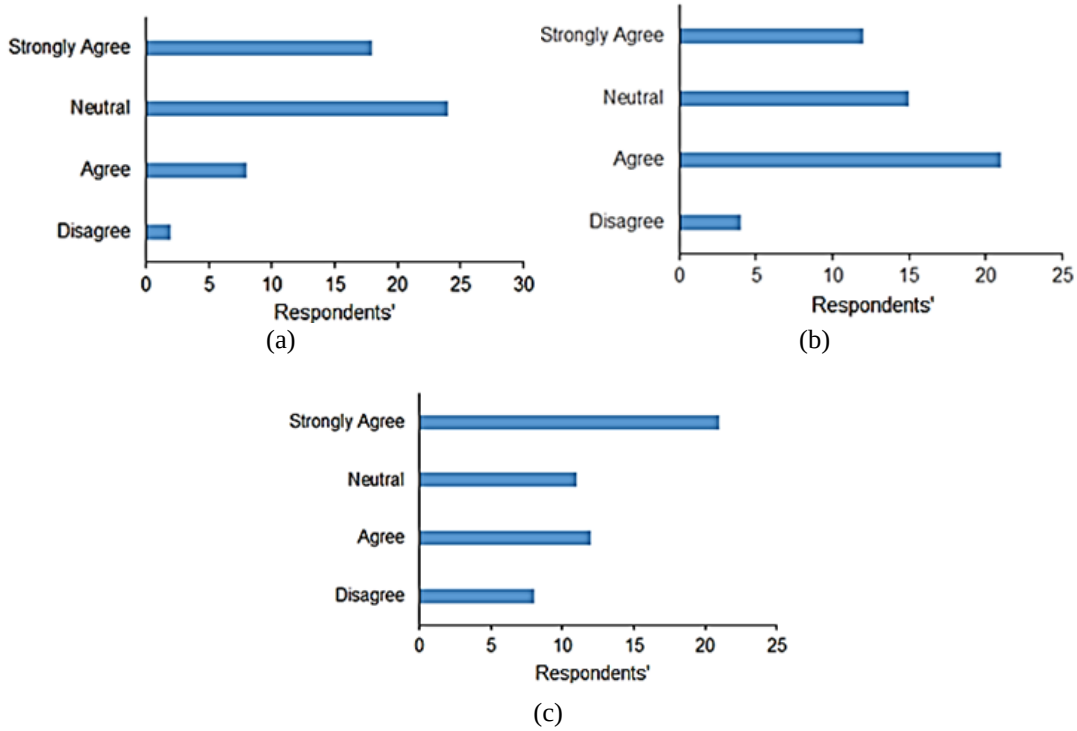


Figure 7. Respondents' opinion on; (i) the safety of the harness, (ii) the durability of the walking belt, and (iii) the safety of *PhyMill* equipment

4. DISCUSSION

4.1. Awareness and knowledge

From this survey, it is found that the respondents are well aware of CP and are educated on the causes and effects of this disease. Awareness and knowledge of CP are vital to accept and accommodate situations involving it. Although CP is neither a contagious nor a genetic disease, it is vital to be aware of its existence as more care and attention should be given to children who are diagnosed with it [34]–[36]. Lack of knowledge will only bring about detrimental effects as parents and society will be unclear and unprepared to encounter CP thus putting the child's life in displease or even danger.

4.2. *PhyMill* treatment on ergonomics aspect

The responsive feedback of *PhyMill* treatment on ergonomics showed the *PhyMill* is good posture during the walk, standard, and comfortable invention. The goal of creating wellness is often focused on ergonomics aspects, and not nearly enough attention is paid to those that engage the sensory part of the user. It is well known that comfort and pain are not the same, and both must be taken into account in the design of the *PhyMill*. Nevertheless, there is always room for improvement because it is also found that the harness and grip of the *PhyMill* may cause discomfort to the user. One of the improvements that can be made to the harness and grip is to design a more durable and comfortable material to accommodate a user of different heights and weights. An in-depth simulation analysis can be carried out beforehand to test the strength of materials that have a good potential to be used before employing them in the prototype.

4.3. *PhyMill* treatment on biomechanics aspect

The responsive feedback of *PhyMill* treatment on biomechanics is evident that the *PhyMill* equipment is user-friendly, has good functions in terms of walking movement, and is recommended to be used by children diagnosed with CP. It helps in the conditioning of the patients in terms of mobility and gait. Patients utilizing this equipment can see positive long-term impacts as the body becomes more adapted to walking, thus improving mobility. The *PhyMill* could also be improved to accommodate children with a wide range of height and weight by adjusting the grip height and harness size accordingly.

4.4. *PhyMill* treatment on the safety aspect

Safety is an important parameter when it comes to medical equipment. The equipment has to be hazard-free to provide maximum confidence and comfort to the user. In the case of the survey on the *PhyMill* equipment, the harness material could be improved to increase its usage spectrum. For instance, a composite material of greater strength can be used as a harness to support the patients, especially those who are of a heavier scale. This is important because errors in medical training and treatment must be eliminated as much as possible to cater to the best standards. Moreover, the walking belt material also can be improved by integrating a tougher material to withstand wear and tear while having a longer lifespan. The mechanical parts such as the gears and belts that move the walking belt should be completely secured as they could pose a danger to children who are around the machine.

5. CONCLUSION

In conclusion, students are thought to have strong knowledge about CP and a supportive attitude toward people with CP, particularly youngsters with CP. Positive attitudes are critical for patients in terms of their academics, employability, and community interactions. These findings highlight the importance of implementing a variety of techniques to increase student awareness and knowledge of CP. As a result, campaigns and programs to promote knowledge and awareness of CP and people with CP should mainly focus on teenagers, men, and the less educated. Overall, all of the objectives have been accomplished.

One of the recommendations from this study is that students are always advised to have a deeper lookout on family members or friends who are experiencing this health condition to prevent any sort of further problems. The *PhyMill* will require a certain amount of understanding of how it works and its limitations, yet the fact that there is a way to treat and handle this condition is a more positive way to view it. Also, the machine can be more user-friendly to all categories of children by improving the design of support and handle. This will enable *PhyMill* to reach a diverse range of children who are equally important as well.

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