

# Influence of Wheelchair Technology to the Physical Health of People with Physical Disability

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## ABSTRACT

The purpose of this study is to determine the influence of wheelchair technology in terms of wheelchair satisfaction and skills to the physical health of people with physical disability. **Methods:** A descriptive correlational study design was conducted on 360 people with physical disability wheelchair users aged 18 – 60 years old living in the Philippines using a purposive sampling technique. **Findings:** Study showed that majority were less satisfied with their wheelchair, had average wheelchair skills and had poor physical health. Correlational analysis revealed that wheelchair satisfaction and skills had significant relationship with physical health. Wheelchair satisfaction and skills were also predictors of physical health. **Value:** The result of the study will inform people with physical disability the importance of improving their wheelchair skills to improve their physical health and better transport and access to different places. Also, the study will inform wheelchair users and providers about the importance of using an ergonomically designed wheelchair for optimum physical health.

**Keywords:** *wheelchair skills, wheelchair satisfaction, physical health*

## INTRODUCTION

People with Disabilities (PWD) are one of the most marginalized groups in the world and now considered to be a human rights issue. Also, the world population is composed of 16% of people with disabilities (PWD) who appraised to be 1.3 billion. This is a 5% increase from the previous report of the World Health Organization in 1970 (World Health Organization [WHO], 2024). In addition, around 200 million are suffering from physical disabilities and approximately 80 million are likely to require wheelchair to assist in mobility (WHO, 2024). Furthermore, people with disabilities experience 15 times more difficulty in accessing and affording transportation compared to those without disabilities (Center for Disease Control and Prevention, 2024). The Disability statistics report revealed that 1 in 4 (27%) adults have disability in the United States (US) in which the disability population increase from 12.6% in 2015 to 27% in 2023. In addition, majority of the population with disability are from the working age of 18-64 (51.1%), followed by age 65 and above which is accounted for 41.2%. Whereas for dependent age 5-17 years old has only 7.2% and 0.4% for 5 years old and below. Also, across all ages, the most common type of disabilities are physical disability which refers to functional mobility (12.1) and cognition (12.8%), followed by independent living (7.2%), hearing (6.1%), vision (4.8%), and self-care (3.6%) (CDC, 2024).

The Philippine Statistics Authority reports that the total population of PWD in the country is 1,442,586 with men comprised of 50.9% (733,779) and women, 49.1% (708,807). Also, 1.57% of the population is composed of people with disability or estimated as 16 for every one thousand are suffering from disability. Calabarzon (IV-A) and NCR had the most number of disability which is around 193,000 and 167,000, respectively. While the Cordillera Administrative Region (CAR) had the least at 26,000. Ten regions had a disability population above the national estimate. These were Western Visayas (1.95%), Mimaropa and Bicol Regions (1.85% each), Eastern Visayas (1.75%), Cagayan Valley (1.72%), Ilocos Region (1.64%), CAR (1.63%), Davao and Central Visayas Regions (1.60% each), and CARAGA (1.58%). In addition, most of the affected age group was in the working age of 15 – 64 years old (59.0 %), followed by 22.1% for aged 65 years and above, and 18.9% for aged 0 to 14 years. Furthermore, the most common type of disability is physical disability which comprises about 41,551 (Department of Labor and Employment (DOLE), 2024). However, in the Asian and Pacific region, there is no available data on the number of people with disabilities that require wheelchairs (WHO, 2023).

In spite of the many programs and policies that have been launched, the physical health of PWD, particularly those with physical disability, are still poor. They encounter barriers that keep them from choosing where they live and work (Pouresmaell et al., 2024). Thus, studies on the influence of wheelchair satisfaction and skills on the physical health are of great importance to the escalating number of people with physical disability. Many studies have been conducted regarding the prevalence of disabilities, as well as the disability rights of a person, which mostly focused on the geriatric population and PWD in general. However, there is comparatively less literature available in the Philippines on the influence of specific variables used by the researcher among physically disabled person. Thus, this study is intended to determine the influence of wheelchair technology in terms of wheelchair satisfaction and skills to the physical health of people with physical disability.

## **LITERATURE REVIEW**

A study showed that any form of long-term physical impairment might negatively influence physical health, People with disabilities are continuously exposed to multiple barriers that deteriorate their physical health. Also it resulted to further impairment in performing activity while on a wheelchair (Keramat et al., 2022). Another study showed that physical health score becomes poorer as age increases and the presence of a disability is associated with worsening physical health conditions compared to people without disabilities. Thus, the government needs to provide necessary health intervention and create policies that will focus on the health of people with disability (Pandit, 2016). Accordingly, poor physical health was found in individuals with a history of low functional mobility, and low engagement in community programs. (White et al., 2016).

Also, the study of Sahlin and Lexell (2015) found that people with disability who engaged in various community works and activities influence the physical domain of health-related quality of life. Furthermore, studies by the Center for Community Health and Evaluation and Human Impact partners (2015) and Patel, Kidd, and Frederick (2018) identified the connection between strong community engagement due to high skills in maneuvering wheelchair and better physical health conditions.

Furthermore, the study found that people with disability were more likely to bear serious physical health conditions due ill-fitted wheelchair and high mortality rates than non-disabled people. However, involving them in wheelchair training will reduce health disparity due to high participation to community programs (O' Mara-Eves, 2015). Moreover, study showed several variables were associated with physical health such as the study of Rajati et al. (2018) in which they showed that high self-care activities due to better wheelchair maneuvering contributed to better physical health. Also, high physical activity engagement had a better effect on physical health (Schmidt et al., 2017). The above literature review found that most PWPDP suffer from poor physical health. Moreover, it also reveals that community participation and engagement in physical activity due to wheelchair skills can influence the physical health of PWPDP. Study conducted by Sadiya (2016) showed that people were not satisfied with their own wheelchair as well as wheelchair services. Authors attributed the result to lack of wheelchair provisions that caused several physical problems such as pressure sores, pain and urinary tract infections due to immobility and if there are provisions for wheelchair, most of the wheelchairs donated were uncomfortable and difficult to handle. Hence, having an ergonomically designed wheelchair can increase their satisfaction and will have an impact to their health status, socioeconomic status and employability (Shore, 2017).

The study of Williams et al. (2017) attributed the limited time of wheelchair use to lack of wheelchair repair and services as well as due to the heaviness and difficulty to adjust the parts and accessories of the wheelchair. Consequently, more energy expenditures are needed by wheelchair users in handling their wheelchairs. If these issues will not be resolved, these will significantly affect the users' satisfaction. As a result, the importance of a careful observation and evaluation of the users' capacity, personal preferences, skills, and lifestyle as well as his medical needs to complement on the selection of wheelchair and prescription such as the measurement of seat height, arm rest, seat width etc. and prioritized the comfort, adjustability, durability to enhance the satisfaction of the users. One of the major factors that lead to community re-integration and independency of wheelchair users aside from having an ergonomically designed wheelchair is the skills in maneuvering the wheelchair. Skills specific to wheelchair-use is a new construct defined as individual's ability to maneuver their wheelchair in a different pavements and settings (Best et al., 2015). However, study found out that majority of wheelchair users have significant limitation on wheelchair skills. The results of the studies showed that wheelchair users frequently described past experiences with ill-fitting wheelchairs and little formal training to use wheelchairs effectively. Most participants acknowledged that they received wheelchairs that have been difficult to use and were not formally trained to maneuver on different terrain and facilities. These studies concluded that rehabilitation training such as wheelchair skills during the first phase of wheelchair prescription are needed in order for the users to attain their maximum functional potential (Sakakibara & Miller, 2015). In the studies of Amosun et al. (2016) and Standfill and Jensen (2017), they showed that ergonomically designed, safe, durable and properly maintained wheelchairs are assurance of more satisfied consumers which enabled them to be more active and skillful in wheelchair propulsion and influenced the degree of participation in the community. Likewise, a study was conducted assessing the wheelchair skills of spinal cord injury wheelchair users using the wheelchair skills test. Examiners reported that the highest skills the respondents can perform were folding and unfolding, followed by stationary wheelie, then turning around, moving from floor to wheelchair, then ascending and descending curbs, while respondents had difficulty performing other skills included in the wheelchair skills test. In addition, young

paraplegic male who were employed had better wheelchair skills scores. Besides, very good wheelchair skills predicted better physical health-related quality of life (Smith et al., 2016).

## METHODS

This study utilized the descriptive-correlational design to determine the influence of wheelchair technology in terms of wheelchair satisfaction and skills to the physical health of people with physical disability. The instrument was developed and pretested to 50 respondents who were members of the federation of people with disability- Pasay Chapter and patients from one hospital in Pasay City. The Cronbach Alpha was computed and had the following alpha reliability coefficient: Wheelchair satisfaction, .922; Wheelchair skills, .989; Physical Health, .972. Hence confirming the validity and reliability of the pre-tested instrument. The results assured that items within constructs are consistent with each other. Thus, the final data gathering was conducted and collected 360 people with physical disability wheelchair users aged 18-60 years old who are living in the Philippines and purposive sampling methods were utilized. Of the 360 respondents, 160, 123 and 77 were from Luzon, Visayas and Mindanao respectively.

## RESULTS AND DISCUSSION

Table 1 discusses the extent of the respondents' wheelchair technology in terms of wheelchair satisfaction and wheelchair skills. Wheelchair satisfaction is presented in Table 1 and wheelchair skills in Table 2. Table 1 presents the extent of PWPDP wheelchair users' satisfaction to their wheelchair. The findings revealed that the overall satisfaction to wheelchair was rated "*less satisfied*" with a *mean* score of 2.40 (*SD* = 1.101).

The study also showed that all items except the cost was rated "*less satisfied*" which means that most PWPDP wheelchair users were less satisfied with their wheelchairs and perceived that their present wheelchairs were not durable, not safe and secured, difficult to maneuver, adjust and fold, cause body pains, discomfort and pressures sores, not properly aligned to their body and have poor maintenance and repair services. However, when it pertains to the cost of the wheelchair, most of the respondents rated it as "*quite satisfied*". This is because most of the wheelchairs used by PWPDP were donated by local and non-local government units. However, the result still revealed their low satisfaction to their own wheelchair. Studies conducted by Griggs (2024) and Sadiya (2016) supported the result of this study in which they showed that people were not satisfied with their own wheelchair as well as wheelchair services. Authors attributed the result to lack of wheelchair provisions that caused several physical problems such as pressure sores, pain and urinary tract infections due to immobility and if there are provisions for wheelchair, most of the wheelchairs donated were uncomfortable and were difficult to handle.

It is important that an ergonomically-designed wheelchair must be prescribed to wheelchair users. Findings from this study must be properly addressed to those valued stakeholders or agencies who are donating wheelchairs to PWPDP to prevent the negative effects of a non-fitted wheelchair. Wheelchair is considered a part of the users' body and they are bound to it. Therefore, it is important to make the PWPDP wheelchair users satisfied to their own wheelchairs because this will enhance their mobility and independence to their daily activities and transport.

**Table 1**  
*Extent of Respondents’ Wheelchair Satisfaction*

<b>How satisfied are you with your own wheelchair in terms of:</b>	<b>MeanSD</b>	<b>Scaled Responses</b>
1. Height	2.43 1.260	Less Satisfied
2. Length	2.40 1.223	Less Satisfied
3. Seat dimension	2.35 1.245	Less Satisfied
4. back rest	2.34 1.241	Less Satisfied
5. knee to footplate distance	2.31 1.233	Less Satisfied
6. Lightweight	2.20 1.212	Less Satisfied
7. ease in adjusting and fastening the parts	2.20 1.191	Less Satisfied
8. durability	2.23 1.223	Less Satisfied
9. safety and security	2.25 1.275	Less Satisfied
10. comfort (ex. no body pains and pressure sores)	2.25 1.259	Less Satisfied
11. use and maneuvering of the wheels	2.24 1.235	Less Satisfied
12. folding and unfolding	2.16 1.235	Less Satisfied
13. repairs and service maintenance	2.20 1.194	Less Satisfied
14. Cost	4.09 1.327	Quite Satisfied
<b>Wheelchair Satisfaction</b>	<b>2.40 1.101</b>	<b>Less Satisfied</b>
Legend: 1- <i>Not Satisfied</i> . 2- <i>Less Satisfied</i> 3- <i>More or Less Satisfied</i> 4- <i>Quite Satisfied</i> 5- <i>Very Satisfied</i> 1.0 – 1.49 1.50 – 2.49 2.50 – 3.49 3.50 – 4.49 4.50 – 5.0		

Table 2 presents the extent of PWPDP wheelchair users’ wheelchair skills. The findings revealed that the overall wheelchair skills of PWPDP wheelchair users was “average” with a mean score of 2.86 ( $SD = 1.245$ ). The result of the study means that PWPDP wheelchair users can do the skills using their wheelchairs with little help or minimal (25 - 50%) assistance from others. It shows that most of the skills done by PWPDP on wheelchair was “average” although highest skills made was wheelchair push-ups with a mean of 3.61 ( $SD = 1.303$ ) which is interpreted as “high skills”. This means that when doing wheelchair push-ups, wheelchair users can safely do it by themselves but with difficulty. However, there were three wheelchair skills that were rated as “low skills” such as doing stationary wheelie, ascend curbs and maneuver sideways with a mean of 2.27 ( $SD = 1.559$ ), 2.39 ( $SD=1.559$ ), and 2.45 ( $SD =1.505$ ), respectively. This means that when doing wheelchair stationary wheelie, ascend curbs, and maneuver sideways, wheelchair users are able to do these skills but with more help or with moderate (50 – 75%) assistance from others.

This result is better than the findings of several studies (Mathis and Gowran, 2023; Sakakibara and Miller, 2015), in which they found out that majority of wheelchair users have significant limitation on wheelchair skills. The results of the studies showed that wheelchair users frequently described past experiences with ill-fitted wheelchairs and little formal training to use wheelchairs effectively. Most participants acknowledged that they received wheelchairs that have been difficult to use and were not formally trained to maneuver on different terrain and facilities.

**Table 2**  
*Extent of Respondents' Wheelchair Skills*

Using my wheelchair, I am able to...	Mean	SD	Scaled Responses	V.I.
1. ascend ramps	2.77	1.391	Do with minimal assistance from others	Average
2. descend ramps	2.89	1.438	Do with minimal assistance from others	Average
3. turn while moving forward	2.59	1.611	Do with minimal assistance from others	Average
4. turn while moving backward	2.55	1.579	Do with minimal assistance from others	Average
5. shift my weight from side to side	3.48	1.664	Do with minimal assistance from others	Average
6. ascend curbs	2.39	1.599	Do with moderate assistance from others	Low Skills
7. descend curbs	2.53	1.553	Do with minimal assistance from others	Average
8. do stationary wheelie	2.27	1.559	Do with moderate assistance from others	Low Skills
9. fold and unfold	2.72	1.573	Do with minimal assistance from others	Average
10. avoid moving obstacles	2.96	1.455	Do with minimal assistance from others	Average
11. roll longer distance > 250 meters	2.89	1.487	Do with minimal assistance from others	Average
12. maneuver sideways	2.45	1.505	Do with moderate assistance from others	Low Skills
13. get through hinge doors	3.07	1.444	Do with minimal assistance from others	Average
14. pick objects from floor	3.40	1.209	Do with minimal assistance from others	Average
15. reach high objects	3.26	1.200	Do with minimal assistance from others	Average
16. do wheelchair push-ups	3.61	1.303	Do by myself with difficulty	High Skills
<b>Wheelchair Skills</b>	<b>2.86</b>	<b>1.245</b>	<b>Do with minimal assistance from others</b>	<b>Average</b>

Legend:

1 - Not possible (76 – 100% assistance)	1.0 – 1.49	Very low skills
2 - I can DO THE SKILLS but with MORE HELP OR MODERATE (51 - 75%) ASSISTANCE from others	1.50 – 2.49	Low Skills
3 - I can DO THE SKILLS but with LITTLE HELP or MINIMAL (25 - 50%) ASSISTANCE from others	2.50 – 3.49	Average Skills
4 - I can safely DO THE SKILLS BY MYSELF but WITH DIFFICULTY (0 – 24% assistance)	3.50 – 4.49	High Skills
5 - I can safely DO THE SKILLS BY MYSELF WITHOUT DIFFICULTY (no assistance)	4.50 – 5.0	Very high Skills

The results have implications for understanding and improving physical health through improvements in wheelchair skills by education and training. Therefore, PWPDP wheelchair users need to develop their wheelchair skills because this is important in doing their activities of daily living and to enhance their independency in wheelchair mobility and can able to maneuver in different places such as work, parks, and commercial buildings.

Table 3 presents the extent of physical health of the respondents. It revealed that the respondents' overall physical health was rated “poor” ( $M = 2.48$ ;  $SD = 1.335$ ). The highest mean scores were on the items about sleeping such as having a good sleep ( $M = 3.03$ ;  $SD = .931$ ), woke up several times during the night ( $M = 2.68$ ;  $SD = 1.137$ ) and felt dizzy whenever

moving from one place to another ( $M=2.53$ ;  $SD = 1.150$ ) which are both negative items. These three items were interpreted as “average” which means that PWPD sometimes experienced waking up several times during the night, felt dizzy when moving from one place to another and sometimes experienced having a good sleep. The rest of the items were interpreted as “poor” which means that PWPD wheelchair users often times felt physical symptoms such as shortness of breath, heaviness on left chest, body pains, weakness, numbness, soreness on their buttocks and tightness in their muscles and joints.

**Table 3**  
*Extent of Respondents’ Physical Health*

<i>For the past 1 month, I...</i>	<b>Mean</b>	<b>SD</b>	<b>Scaled Responses</b>	<b>V.I.</b>
1. had shortness of breath.*	2.39	.982	Often	Poor
2. felt heaviness on my left chest.*	2.42	.915	Often	Poor
3. had enough energy.	2.46	1.435	Rarely	Poor
4. had body pains that prevents me from doing what I need to do.*	2.46	1.435	Often	Poor
5. have good sleep.	3.03	.931	Sometimes	Average
6. felt weak and avoided some activities in my daily task.*	2.49	1.478	Often	Poor
7. have the strength to perform my daily task.	2.48	1.348	Rarely	Poor
8. get sick easily.*	2.46	1.576	Often	Poor
9. felt the need of a medical intervention to function normally in my daily activities.*	2.29	1.596	Often	Poor
10. felt dizzy whenever I started to move from one place to another.*	2.53	1.150	Sometimes	Average
11. have difficulty of keeping pace with my peers in long distance wheeling.*	2.36	1.572	Often	Poor
12. woke up several times during the night.*	2.68	1.137	Sometimes	Average
13. felt soreness on my buttocks.*	2.34	1.362	Often	Poor
14. had tightness in my muscles and joints.*	2.32	1.321	Often	Poor
15. felt numbness on some parts of my body.*	2.44	.980	Often	Poor
16. did not feel fatigue	2.46	1.265	Rarely	Poor
17. have some bruises or wounds on some parts of my body.*	2.47	1.416	Often	Poor
<b>Physical Health</b>	<b>2.48</b>	<b>1.335</b>	<b>Rarely</b>	<b>Poor</b>

\*negatively stated items were re-coded.

Legend: 1- *Never*                      2- *Rarely*                      3- *Sometimes*                      4- *Often*                      5- *Always*  
 1.0 – 1.49- *Very Poor*                      1.50 – 2.49- *Poor*                      2.50 – 3.49- *Average*                      3.50 – 4.49- *Good*                      4.50 – 5.0- *Very Good*

The result of this study conforms to several studies (Canha et al., 2016; Kuvalekar et al., 2015), in which they found out that the physical health of PWPD was poor than the population as a whole. People with impairments always experience body pains, discomfort, decrease in energy and shortness of breath that disrupts their normal activities. Also, dissatisfaction with their capacity and performance to do their daily activities as well as inaccessibility to health care and poor social inclusion, stigma and injustices are reasons for having dissatisfaction with the physical health of PWD (Copestake et al., 2014). The result of the study implies that PWPDs are highly associated with poor physical health. The more they become physically dependent, the more their functional mobility and productivity will further decline. Thus, there is a need to provide medical intervention to achieve optimum health which are free from any physical symptoms. Accessibility to health-care services as well as compliance to medical treatment are the initial steps to alleviate the conditions of PWPD.

Table 4 presents the relationship of wheelchair technology such as wheelchair satisfaction and skills and physical health. Findings showed relationship between wheelchair technology such as wheelchair satisfaction and skills and physical health with an alpha significance level of .000 and an r of .81. Examining the data more carefully, each dimension of wheelchair technology has contributed to the variability of the overall relationship. In terms of physical health, wheelchair skills have the highest correlation ( $r = .81$ ), followed by wheelchair satisfaction ( $r = 0.65$ ). The result of the study means that if PWPD wheelchair users have very good wheelchair skills, have high satisfaction to their own wheelchair, the better is their physical health. The result asserted the study conducted by Baar et al. (2016), in which they found out that a restriction to mobility in household as well as community settings such as absence of ramps, handrails, wide space for wheelchair transport present a large range of physical health outcome, such as poorer health that leads to non-communicable diseases and injuries.

**Table 4**  
*Relationship between Wheelchair Satisfaction, Skills, and Physical Health*

Variable	Physical Health		Verbal Interpretation
	r	Sig	
Wheelchair Technology	.81	.000	<b>Significant</b>
Wheelchair Satisfaction	.65	.000	<b>Significant</b>
Wheelchair Skills	.81	.000	<b>Significant</b>

The result implies that wheelchair satisfaction and wheelchair skills have significant influence on the physical health of PWPD. Most structures at home and ramps are not architecturally designed for wheelchair transport and at the same time PWPD are not satisfied with their wheelchairs since this brings more harm than comfort. Therefore, as health care professionals, these findings will be a basis to create an advocacy program that will facilitate on providing ergonomically-designed wheelchair for PWPD to maximize their potential for



functional independency as well as to have access to regular medical professionals and services to improve their physical health.

Table 5 presents the predictors of physical health. A stepwise multiple regression was calculated to predict physical health-related quality of life based on self-care activities and wheelchair technology. A significant regression was found with  $F$  value of 195.462 (2,989) and an  $R^2$  of .795. This means that the two variables that entered the regression accounting for 79.5% of the variance of physical health. Specifically, wheelchair skills which accounted for 76.5% and wheelchair satisfaction for only 3%. This result implies that the largest predictor of physical health among PWPD wheelchair users was wheelchair skills.

**Table 5**  
*Predictors of Physical Health*

Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig	R <sup>2</sup>
	$\beta$	Std Error	$\beta$			
Wheelchair Skills	.150	.043	.172	3.502	.001	.765
Wheelchair Satisfaction	.068	.035	.069	1.967	.050	.030

$F= 195.462 (2,989); R^2= .795$

This is true with the study wherein paraplegic people with high satisfaction to wheelchair and more skills in maneuvering their wheelchair in different settings predicted better physical health condition (Mehmood et al., 2022). This study implies that in order to obtain a better physical health among PWPD wheelchair users, there is a need to provide them with an ergonomically-designed wheelchair to avoid physical injuries and deformities and improve their wheelchair skills so they could be able to independently transport themselves and have access to different places.

## CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

The following conclusions emerged in light of the findings of the study. The higher their wheelchair satisfaction and skills, the better the physical health of people with physical disability. Also, wheelchair skills and wheelchair satisfaction were predictors of physical health. The study showed that people with physical disability in the Country is suffering from poor physical health conditions due to non-fitted wheelchairs, as well as less durable, unsafe and poor wheelchair services when outworn and misaligned. In addition, most people with physical disability acknowledged that they received their wheelchairs that have been difficult to use and they were not formally trained to maneuver on different terrain and facilities. Thus, this study highlights the importance of prescribing an ergonomically-designed wheelchair to people with physical disability to prevent physical injuries and body structural deformities. Further, the importance of having excellent skills in maneuvering the wheelchair for better access and transport to different places such as work, leisure/recreation, school and community independently.

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