Human Factors in Design, Engineering, and Computing, Vol. 238, 2026, 546–555
https://doi.org/10.54941/ahfe1008287

Cycling by Disabled People in Japan: Current Situation and Future Possibilities

Yoshito Dobashi

Kanazawa Institute of Technology, Nonoichi, Ishikawa, Japan

ABSTRACT

Many previous studies have viewed cycling as a dangerous activity for disabled people. However, changes in social conditions and technological advancements are now enabling disabled people to cycle. This study aims to identify the processes through which disabled people become able to cycle. The current situation in Japan was examined through a review of previous studies, a questionnaire survey, and expert interviews. Responses to the questionnaire survey were obtained from 133 disabled people and 159 non-disabled people across Japan and quantitatively analyzed to examine differences between disabled and non-disabled cyclists in terms of reasons for cycling, motivations, learning processes, and related factors. The analysis yielded three main findings. First, becoming able to cycle was found to be associated with improved well-being among both disabled and non-disabled people, although cycling may serve different functions for these groups, such as leisure or mobility. Second, awareness, participation, and experience sharing emerged as key factors in promoting cycling, as reflected in the responses from current para-cyclists. Third, facilitating this process requires the development of appropriately designed environments and opportunities for participation, as noted by current para-cyclists based on their experiences and insights. Overall, these findings offer implications for human-centered design and the promotion of inclusive mobility.

Keywords: Inclusive design, Adaptive cycles, Well-being, Accessibility, Leisure, Information

INTRODUCTION

The 2020 Tokyo Olympic and Paralympic Games have raised public awareness of parasports, and some parasport athletes have begun to receive increased media attention. At the same time, a growing number of disabled people in Japan who are not competitive athletes have begun to engage in sports along with their greater participation in society, a trend that is receiving increasing social awareness. Across Japan, disabled people are enjoying a variety of sports, including wheelchair basketball, ground softball, wheelchair tennis, and boccia (Ishikawa Prefecture Sports Association for Disabled People, n.a.).

According to the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), there are 60 million cycles in Japan, suggesting that roughly half the population owns a cycle (MLIT, 2020). While it is unclear what proportion of cycle owners are disabled individuals, cycling regulations have been relaxed in certain regions, such as in Tokyo, where tandem cycling on public roads by people with visual impairments has been legalized (MLIT, 2023).

Received July 12, 2026; Revised September 26, 2026; Accepted October 6, 2026; Available online December 1, 2026

© 2026 The Authors. This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 License.
For more information, see https://creativecommons.org/licenses/by-nc-nd/4.0/

Organizations such as the Japan Para-Cycling Federation (JPCF) actively support cycling by disabled people through the introduction of adaptive cycles (JPCF, 2025).

In light of the above, this paper examines the relationship between disabled people and cycling from the following three perspectives:

- Changes in well-being: Assessing the impact of cycling by examining changes in well-being among disabled and non-disabled people before and after becoming able to cycle.
- Current state of cycling among disabled people: Exploring how disabled people become able to cycle through inclusive design, including adaptive cycles.
- Challenges and best practices: Identifying the initial triggers, motivations, and purposes of cycling; the challenges encountered; costs and modifications involved; and views on support measures.

PREVIOUS STUDIES

Previous studies on disability and cycling in Japan have largely focused on cycles as barriers or safety risks for disabled people (Fukuhara et al., 2005), emphasizing their susceptibility to cycling accidents rather than their participation in cycling. More recently, some studies have begun to recognize disabled people as cyclists and to examine rehabilitation cycles and adaptive cycles that enable disabled people to cycle and improve their quality of life (QOL). Nevertheless, research on trends in cycling among disabled people and efforts to promote cycling remain limited. While several practitioners and organizations have reported on their experiences with adaptive cycles and initiatives promoting cycling among disabled people, these have largely taken the form of descriptive reports rather than empirical studies. Furthermore, much of the existing literature is available only in Japanese.

One of the most comprehensive studies on this topic was conducted by the Bicycling Popularization Association of Japan (BPAJ) (2010). Based on 264 responses to a questionnaire, BPAJ examined the limitations that disabled people face, their frequency of outings, their views on cycling, and related issues. It also promoted cycling through test-ride programs involving adaptive bicycles, tricycles, and quadricycles for people with a range of disabilities, including lower-limb, whole-body, visual, hearing, and internal (heart) disabilities. However, the findings from these initiatives were not subjected to academic analysis. Moreover, no comprehensive studies on cycling among disabled people have been identified in Japan since the BPAJ initiative in 2010. These gaps highlight the significance of the present study.

Outside Japan, Clayton et al. (2017) examined issues related to disability and cycling in the UK mainly through interviews, identifying the lack of proper infrastructure and environments as major challenges and highlighting the limited research on cycling among disabled people. Andrews et al. (2018) further point out that the UK lacks a strategic approach to disability and cycling, and that the issue lies in translating ideas into practice. From a technological perspective, Norcliffe et al. (2022) highlighted the importance of accommodating diverse needs in the development and use of cycling

technologies. In the US, Inckle (2019) found through an interview survey that disabled people could develop a more positive outlook on life by overcoming their negative thoughts about cycling.

Previous research has suggested that cycling may offer a range of benefits to disabled people. Becoming able to cycle may enhance subjective well-being, which is generally understood as individuals' evaluation of their experiences and life circumstances (Diener, 1984). In addition, mobility has been identified as an important factor in promoting social participation and quality of life among disabled people (Williams and Willmott, 2012), while cycling itself has been associated with physical, psychological, and social benefits (Oja et al., 2011). However, much of the existing research on disability and cycling has relied on qualitative approaches (Clayton et al., 2017; Fishman et al., 2012; Cox and Bartle, 2020). Although Hatzakis et al. (2024) conducted a quantitative study, they did not employ statistical methods to compare disabled and non-disabled people. By adopting a quantitative approach and statistically comparing these groups, the present study provides empirical support for the benefits of becoming able to cycle and offers new insights into cycling among disabled people.

PURPOSE

This study aims to examine (1) the relationship between cycling and well-being, (2) the process through which disabled people become able to cycle, and (3) the environmental and social factors that facilitate cycling among disabled people.

METHODOLOGY

Methods

A questionnaire survey was conducted via disability-related organizations, university networks, and social media, as shown in Table 1.

Table 1: Overview of research methods.

Method	Timeframe	Description
Questionnaire survey (anonymous)	May 1–31, 2025	• Google Form distributed mainly at Kanazawa Institute of Technology (KIT) • 35 questions, including age, cycling status, disability status, circumstances leading to becoming able to cycle, costs of acquiring a cycle, purpose of cycling, sense of well-being, etc. • Responses from 133 disabled people and 159 non-disabled people
Interviews	July 2025	Two specialists: • Mr. Wataru Matsumoto, Executive Director of the Japan Para-Cycling Federation • Mr. Hiroshi Nojima, Representative Director of ZEN and Visiting Professor at Kanazawa Institute of Technology
Literature review	January–May 2025	Previous studies on disability and cycling in and outside of Japan

Ethical Considerations

The above survey and interviews were conducted in compliance with the code of ethics of the university to which the author is affiliated ("Ethics review of research involving human subjects" approval no. 2412003).

SURVEY RESULTS

The questionnaire survey gained responses from 133 disabled participants and 159 non-disabled participants from across Japan, representing a wide range of ages, regions, and disability types. Among the disabled respondents, 81% had lower-limb physical disabilities.

Cycling Participation

Disabled people were significantly less likely than non-disabled people to have experience cycling and to cycle regularly, as shown in Table 2 ($p < 0.01$). The relatively high proportion of disabled respondents with cycling experience may be attributable to the fact that many were recruited through networks related to para-cycling.

Table 2: Cycling participation among disabled and non-disabled people.

Variable	Disabled (N = 133)	Non-Disabled (N = 159)	χ^2 (Note 1)	p	Statistical Significance (Note 2)
Have cycled	101 (76%)	156 (98%)	33.752	<0.01	**
Have never cycled	32 (24%)	3 (2%)			
Cycle regularly	81 (61%)	144 (91%)	36.044	<0.01	**

(Note 1) All χ^2 tests were conducted with 1 degree of freedom (df = 1).
(Note 2) **: 1% or less, *: 5% or less.

Table 3: Process of becoming able to cycle.

Process	Disabled (N = 133)	Non-Disabled (N = 159)	χ^2 (Note 1)	p	Statistical Significance (Note 2)
Cycling felt natural	24%	81%	95.363	<0.01	**
Acquired information naturally	22%	71%	112.139	<0.01	**
Encouraged by friends/acquaintances	32%	9%	22.607	<0.01	**
Sought information independently	22%	9%	9.746	<0.01	**
Learned through own efforts	20%	12%	3.208	0.076	Not significant

(Note 1) All χ^2 tests were conducted with 1 degree of freedom (df = 1).
(Note 2) **: 1% or less, *: 5% or less.

Process of Becoming Able to Cycle

Compared with non-disabled people, disabled people were less likely to encounter opportunities to cycle naturally and more likely to rely on

encouragement from friends and independent information seeking, as shown in Table 3. Statistically significant differences were found between disabled and non-disabled people in four of the five processes examined in the questionnaire. Overall, disabled people were less likely than non-disabled people to acquire cycling-related information and skills naturally.

Types of Cycles Used by Respondents

As shown in Table 4, two-wheeled bicycles were the most common type of cycle (131 respondents), with pedal bicycles accounting for the largest share (117 respondents). The next most common were three-wheeled handcycles, with 48 respondents reporting their use. The cycles used by respondents included both commercially available models and those modified by users, cycle shops, or specialist workshops.

Tokyo and some other local governments have relaxed regulations governing tandem cycles on occasion of the Tokyo Olympic and Paralympic Games, allowing people with visual impairments to ride on public roads as stokers if accompanied by a sighted pilot. In the survey, 6 out of 133 respondents (5%) reported riding tandem cycles, suggesting their potential for future growth.

Table 4: Types of cycles used by disabled respondents (multiple answer, N = 133).

Cycle Type	Pedal	Hand	Total (Pedal & Hand)
Two-wheeled	117	14	131
Three-wheeled	18	48	66
Tandem	5	1	6
Other	8	9	17

(Note) Totals may exceed 133 because respondents were allowed to select multiple answers.

Cycle Modifications and Adjustments

Disabled people reported a variety of modifications, adjustments, and challenges related to becoming able to cycle. These included cycle modifications, adjustments to riding techniques, physical training, and environmental barriers. As shown in Table 5, common issues included maintaining balance, transferring from a wheelchair, riding on hilly roads, and storing cycles.

Table 5: Modifications, adjustments, and barriers related to becoming able to cycle.

Category	Examples
Vehicle modifications	Gear modifications, one-foot pedaling, foldable mechanisms
Riding techniques	Maintaining balance, cornering, seating adjustments
Physical training	Strength and endurance training, overcoming fear
Environmental and accessibility barriers	Transferring from a wheelchair, cycle storage, hilly roads

Purpose of Cycling

As shown in Table 6, statistically significant differences were found between disabled people and non-disabled people in their purposes of cycling. While non-disabled people were more likely to cycle for transportation-related purposes (Purposes A–C), disabled people were more likely to cycle for leisure, enjoyment of cycling, and the thrill of speed (Purposes D–F).

Table 6: Purpose of cycling (multiple answer).

	Purpose	Disabled (N = 133)	Non-Disabled (N = 159)	χ^2 (Note 1)	P	Statistical Significance (Note 2)
A	Daily transportation	16%	55%	47.09	<0.01	**
B	Occasional transportation	11%	35%	21.6	<0.01	**
C	Faster travel	26%	71%	58.03	<0.01	**
D	Leisure	51%	25%	22.07	<0.01	**
E	Enjoyment of cycling	28%	16%	5.63	0.022	*
F	Thrill of speed	38%	9%	34.61	<0.01	**

(Note 1) All χ^2 tests were conducted with 1 degree of freedom (df = 1).
(Note 2) **: 1% or less, *: 5% or less.

Well-Being

As shown in Table 7, well-being significantly improved among both disabled and non-disabled people after becoming able to cycle, and no statistically significant differences were found between the two groups either before or after becoming able to cycle. These findings suggest that becoming able to cycle is associated with improved well-being among both disabled and non-disabled people.

Table 7: Changes in well-being before and after becoming able to cycle.

Comparison	Test	Test Statistic (Note 1)	p	Statistical Significance (Note 2)
Non-disabled (before vs. after) N = 147	Wilcoxon signed-rank test	Z = 6.422	<0.001	**
Disabled (before vs. after) N = 98	Wilcoxon signed-rank test	Z = 5.195	<0.001	**
Non-disabled vs. disabled (before) 147/99	Pearson's χ^2 test	χ^2 = 2.533	0.639	Not significant
Non-disabled vs. disabled (after) 148/99	Pearson's χ^2 test	χ^2 = 3.397	0.494	Not significant

(Note 1) Wilcoxon signed-rank tests were used for before–after comparisons within the same respondent groups, while Pearson's chi-square tests were used for comparisons between disabled and non-disabled respondents.
(Note 2) **: 1% or less, *: 5% or less.

As shown in Table 8, disabled respondents identified important measures that could promote cycling among disabled people. These findings suggest that promoting cycling among disabled people requires not only appropriate cycle design but also awareness, opportunities for participation, financial support, and inclusive environments.

Table 8: Measures that could promote cycling among disabled people.

Category	Representative Responses	%
Awareness	Awareness of the availability of adaptive cycles	59
Accessibility	Commercial availability of adaptive cycles, opportunities to try cycling	39–26
Affordability	Subsidies and financial support	22–28
Supportive environment	Safe, easily accessible, and socially accepted cycling environments	14–20

KEY INSIGHTS FROM INTERVIEWS

Semi-structured interviews were conducted with two leaders involved in para-cycling promotion, Mr. Wataru Matsumoto, Executive Director of the Japan Para-Cycling Federation, and Mr. Hiroshi Nojima, Representative Director of ZEN and Visiting Professor at Kanazawa Institute of Technology, to explore the current state of cycling among disabled people in Japan. As a result, three key themes emerged from the interviews. (Note: The views expressed by Mr. Matsumoto are his personal views and do not necessarily represent the official position of the Japan Para-Cycling Federation.)

First, both interviewees emphasized the need to increase awareness and opportunities. They noted that many people are unaware of the existence of adaptive cycles and lack opportunities to try cycling. They therefore highlighted the significance of trial events and outreach activities. Second, the interviewees identified affordability and equipment as major challenges. They pointed out that, in Japan, commercially available adaptive cycles are expensive, limited in availability, and dependent on imported equipment. Third, they stressed the importance of continuity and environment, noting the limited availability of cycle-lending programs, the lack of regular opportunities for participation, and the inadequacy of accessible cycling environments.

DISCUSSION AND ANALYSIS OF THE RESULTS

The findings present three perspectives: well-being, the process of becoming able to cycle, and environmental factors that support cycling among disabled people.

With regard to the first perspective, becoming able to cycle was found to be associated with improved well-being among both disabled and non-disabled people. Although no statistically significant differences were found between the two groups in terms of well-being before or after becoming able to cycle (Table 7), the finding remains significant because it demonstrates that disabled people can experience comparable well-being benefits from cycling.

At the same time, it was found that cycling serves different purposes for the two groups. As shown in Table 6, disabled people were more likely to cycle for leisure, whereas non-disabled people were more likely to cycle for transportation purposes. In addition, disabled people reported having less cycling experience than non-disabled people (Table 2). In sum, these findings suggest that disabled people derive value from cycling in different ways compared to non-disabled people, despite experiencing a similar increase in well-being.

Second, from the perspective of the process of becoming able to cycle, the findings suggest that disabled people rely more heavily on various resources than non-disabled people. As shown in Table 3, while 71% of non-disabled people were able to obtain information about cycling naturally, only 22% of disabled people were able to do so. Furthermore, Table 5 shows that disabled people require various cycle modifications and adjustments in order to become able to cycle. These findings suggest that becoming able to cycle is a more complex process for disabled people than for non-disabled people, as disabled people must go through more steps compared to non-disabled people who often become able to cycle with relatively little difficulty.

The third perspective about environmental factors that support cycling among disabled people was examined through free responses, such as those shown in Table 8, categorized into awareness, accessibility, affordability, and supportive environment. In particular, "commercial availability of adaptive cycles" suggests the need for more commercially available adaptive cycles. Affordability was also identified as an important issue, with roughly 28% of respondents citing financial concerns as an impediment to cycling. Furthermore, the availability of the diverse types of cycles listed in Table 4 and the modifications and adjustments reported in Table 5 were also raised as necessary for disabled people to become able to cycle. With respect to these findings, Mr. Matsumoto noted that no foundation yet exists in Japan for the dissemination and modification of cycles for disabled people. These findings suggest that expanding the availability of both commercially available and adaptive cycles for disabled people, while improving awareness, affordability, and proper environments, would help promote cycling among disabled people.

One limitation of this study is that the measure of well-being was based on retrospective self-reports, which may be subject to recall bias. As a result, the findings may be interpreted as reflecting subjective perceptions rather than objective changes in well-being. Future research should thus employ validated well-being scales to improve measurement accuracy.

A second limitation is that the recruitment process may have resulted in a higher proportion of disabled respondents with an interest in or experience with cycling. Therefore, the cycling participation rates observed in this study should not be interpreted as representative of the disabled population in Japan.

A third limitation is the small number of interview participants. Only two experts in para-cycling were interviewed, limiting the extent to which the interviews can represent the experiences of disabled cyclists. Nevertheless, as both experts have extensive knowledge of and practical involvement in adaptive cycling, including advocacy activities in Japan, the interviews provide valuable expert perspectives. To address this limitation, future research

should include a wider range of para-cyclers in order to capture a broader diversity of lived experiences. As indicated in the questionnaire results, many disabled respondents expressed a willingness to be interviewed, providing an opportunity to incorporate a larger and more diverse group of disabled people into future interviews to complement and extend the findings of this study.

Another aspect for future research would be to conduct similar surveys in a wider range of regions, including countries outside of Japan, to determine whether similar findings are found in other social and cultural contexts.

In sum, the findings highlight the importance of understanding the state of cycling among disabled people, particularly as a form of leisure rather than for transportation purposes. They also underscore the need to raise awareness that cycling is a realistic possibility for many disabled people, and to expand opportunities for disabled people to participate in cycling, including purchasing a cycle.

CONCLUSION

This study found that becoming able to cycle was associated with improved well-being among both disabled and non-disabled people, although cycling serves different purposes between the two groups. Compared with non-disabled people, disabled people are more likely to cycle for leisure than for transportation and tend to require more information and support, as well as adaptive equipment and suitable environments.

To begin with, however, many people remain unaware that cycling is a realistic possibility for disabled people. Therefore, disseminating greater awareness, expanding opportunities to experience cycling, applying inclusive design to cycling, and increasing the availability of adaptive cycles are critical in helping more disabled people become able to cycle and enjoy its added benefits.

Cycling among disabled people is expanding thanks to technological innovations, legal developments, and a growing awareness of the possibility of cycling. This study identified important differences between disabled and non-disabled people in their cycling experiences, frequency, purposes, and processes of becoming able to cycle, while also showing that becoming able to cycle was associated with improved well-being in both groups. However, future challenges remain in addressing the technological, financial, environmental, and social aspects of cycling among disabled people. With greater information sharing, institutional support, and the broader application of human-centered and inclusive design principles, cycling can play an important role in promoting the social inclusion of disabled people. By highlighting the factors that enable disabled people to become able to cycle, this study offers practical implications for promoting accessible cycling as a form of inclusive mobility.

ACKNOWLEDGMENT

I wish to express my sincere gratitude to Mr. Hiroshi Nojima for his support in conducting this study, collecting questionnaire responses, providing valuable information, and introducing relevant contacts regarding cycling among disabled people in Japan.

I also wish to extend my appreciation to Mr. Wataru Matsumoto, Executive Director of the Japan Para-Cycling Federation, for participating in the interview; para-cyclists across Japan for their cooperation with the questionnaire survey; Mr. Shigeki Kobayashi, Chairman of the Bicycle Usage Promotion Study Group, for his assistance in disseminating the questionnaire nationwide; and the students of Kanazawa Institute of Technology for their participation in the survey.

REFERENCES

Andrews, N., I. Clement, and R. Aldred. 2018. "Invisible cyclists? Disabled people and cycle planning – A case study of London." *Journal of Transport & Health*. 8: 146–156.

Bicycling Popularization Association of Japan (BPAJ). 2010. *Seeking cycles that make people happy*: BPAJ. (in Japanese)

Clayton, W., J. Parkin, and C. Billington. 2017. "Cycling and disability: A call for further research." *Journal of Transport & Health*. 6: 452–462.

Cox, B. and C. Bartle. 2020. "A qualitative study of the accessibility of a typical UK town cycle network to disabled cyclists." *Journal of Transport & Health*. 19: 100954.

Diener, E. 1984. "Subjective well-being." *Psychological Bulletin*. 95: 542–575.

Fishman, E., S. Washington, and N. Haworth. 2012. "Barriers and facilitators to public bicycle scheme use: A qualitative approach." *Transportation Research Part F: Traffic Psychology and Behaviour*. 15: 686–698.

Fukuhara, Y., A. Kondo, K. Arimoto, and K. Watanabe. 2005. "Influence of Illegally Parked Bicycles on the Safety of Visually Impaired Pedestrians (with English Abstract)." *Journal of Japanese Association for an Inclusive Society*. 7: 20–28. (in Japanese)

Hatzakis, T., L. Alčiauskaitė, and A. König. 2024. "The Needs and Requirements of People with Disabilities for Frequent Movement in Cities: Insights from Qualitative and Quantitative Data of the TRIPS Project." *Urban Science*. 8: 12.

Inckle, K. 2019. "Disabled Cyclists and the Deficit Model of Disability." *Disability Studies Quarterly*. 39 (4).

Ishikawa Prefecture Sports Association for Disabled People. n.a. "Website of the Ishikawa Prefecture Sports Association for Disabled People." Accessed April 26, 2025. https://i-sho-spo.sakura.ne.jp/kamei.html. (in Japanese)

Japan Para-Cycling Federation (JPCF). 2025. "Japan Para-Cycling Federation (JPCF)." Accessed April 26, 2025. https://jpcfweb.com/. (in Japanese)

Ministry of Land Infrastructure, Transport and Tourism (MLIT). 2020. *Current Situation in the Utilization of Cycles in Japan*. (Documents distributed at an Expert Panel Meeting in 2020): MLIT. (in Japanese)

Ministry of Land Infrastructure, Transport and Tourism (MLIT). 2023. *Current Situation of Promotion of Cycling* (Outline as of 2023): MLIT. (in Japanese)

Norcliffe, G., R. Buliung, A. Kruse, and J. Radford. 2022. "Disability and cycling technology: A socio-historical analysis." *Disability Studies Quarterly*. 42 (1).

Oja, P., S. Titze, A. Bauman, B. de Geus, P. Krenn, B. Reger-Nash, and T. Kohlberger. 2011. "Health benefits of cycling: a systematic review." *Scandinavian Journal of Medicine & Science in Sports*. 21: 496–509.

Williams, G. and C. Willmott. 2012. "Higher levels of mobility are associated with greater societal participation and better quality-of-life." *Brain Injury*. 26: 1065–1071.