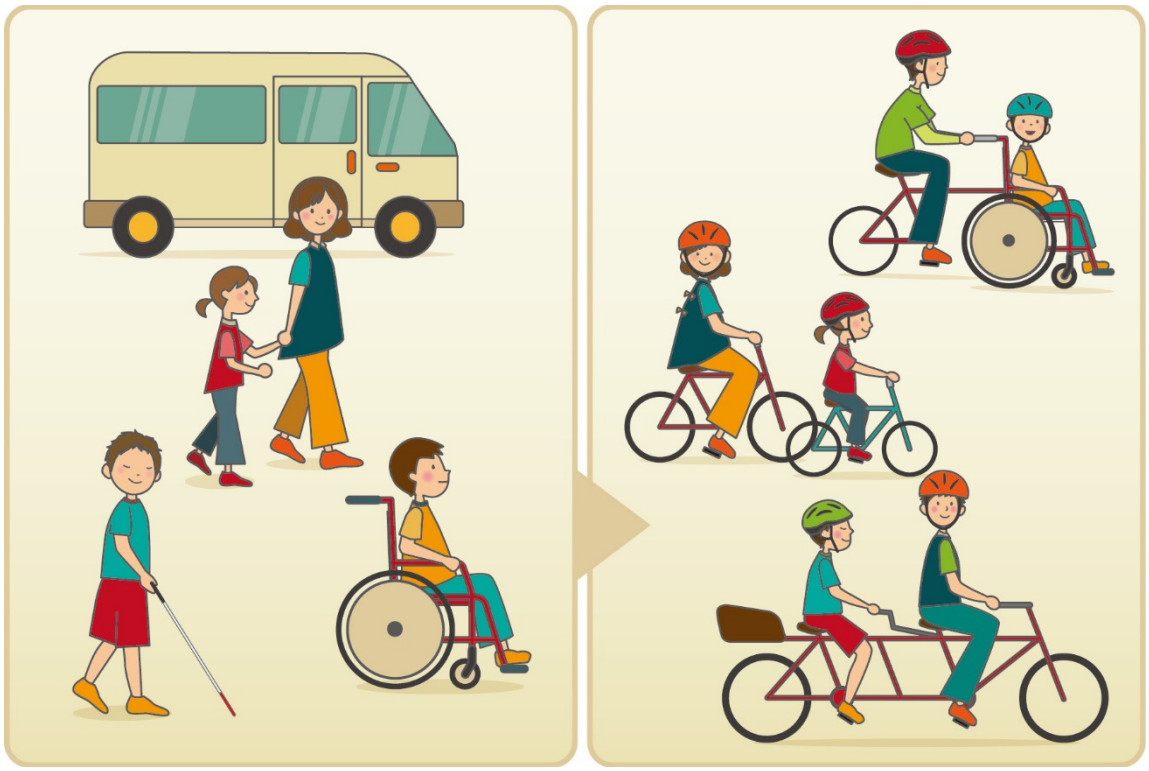
Guide for Bicycle Use by Children with Disabilities

Advocating for inclusive cycling training with joy

For people who want to start a cycling life by enjoying it with children with disabilities in the community



March 2019

International Association of Traffic and Safety Sciences
Bicycling Education Adapted for Children's Level of Development

公益財団法人 国際交通安全学会
International Association of Traffic and Safety Sciences

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1. Introduction

1) Bicycle use by children with disabilities

- What are your impressions when you hear about ‘bicycle use by children with disabilities?’ Many people may respond negatively, with thoughts such as ‘It is dangerous for the children and their surroundings’ or ‘It is impossible to ride a bicycle when you have a disability’. However, are these statements true?

  How is it perceived by people with disabilities themselves? Do they want to ride bicycles, are they unable to ride bicycles despite wanting to, are they not interested in cycling, or are they insecure? Many of these questions can arise from the phrase ‘children with disabilities’.

- Nevertheless, there are many people who ride bicycles despite having disabilities, and there are many others who would like to ride them if they had the opportunity. Some people with disabilities have experience in cycling, while others have never had this opportunity. There are many others who would like to help people with disabilities.

  Furthermore, there are many types of disabilities of varying degrees and, therefore, there are various types of bicycles adapted for them.

- However, there is very little information about bicycle use by children with disabilities in Japan. What is the approximate percentage of people with disabilities who use bicycles? What are the conditions that must be met so that they can use bicycles? What are the latent needs and obstacles to bicycle use? What kinds of adaptations are required to make a bicycle-friendly environment for people with disabilities? In fact, many things are still unknown, and this uncertainty itself creates an obstacle.

2) Tandem (two-rider) bicycle as a potential disability-adapted mode of transportation

- There is a demand for tandem (two-rider) bicycles among people with disabilities, whose transportation options are normally limited to cars and public transportation as a mode of transportation through the living sphere, to promote health and provide a sports opportunity. For example, it is used for the bicycle segment by visually impaired athletes in the paratriathlon, and there is gathering momentum to train athletes and prepare the riding environment for the coming Tokyo Olympics in 2020.
- Tandem bicycles can increase mobility and improve the health and quality of life (QOL) of people who are not able to ride bicycles autonomously such as people with disabilities, leg or back problems, or intellectual disabilities. The widespread use of tandem bicycles is anticipated as a touchstone for actualising a society that provides equal and free mobility as Japan becomes a full-scale aging society.
- However, awareness on this issue remains low. There is a lack of pilots, who occupy the front seat of bicycles, and supporters, who help people with disabilities to use bicycles freely. Furthermore, traffic laws in many Japanese prefectures prevent the use of tandem bicycles on all public roads. For example, the lack of bicycle paths on the roads is one of the obstacles to a wider use of tandem bicycles.

3) How to use this guide

- This guide outlines the use of bicycles, support for riding them, and associated policies for the use of bicycles, namely, tandem (two-rider) cycling, by children with disabilities, based on hearings on actual users of (tandem) bicycles and their supportive organisations.
- This guide has been prepared to provide case examples that may inspire activities for people, mainly supporters, who would like to use bicycles with children with disabilities in the community.

2. Required support

1) Important elements for providing support

- Riding a bicycle requires a continuous series of complex and simultaneous movements as well as judgments that can be difficult to master at once, with or without disabilities. Therefore, the range and methods of learning are different depending on the levels of physical and mental capacity and development.
- However, this range can be broadened regardless of the person's disabilities by keeping up their motivation, understanding their individual abilities, and responding thoughtfully when providing support.
- This section introduces the important elements of support in the initial stage of cycling classes.

Important elements of support	
1. Communication	Good communication between participants and instructors comes first. Advice should be taken from the family and others who know the participant, to gain their trust while exploring the appropriate means of communication with the participant.
2. Vehicle-related support (Physical aid)	Physical abilities are needed to pedal, balance, or brake while riding a bicycle. Certain disabilities may limit an individual's abilities to the complete execution of these manoeuvres. In this case, modifications made to the vehicle itself can minimise these limitations.
3. Learning (Learning aid)	To use a bicycle safely, it is essential to understand traffic rules and the order of priorities in certain situations. Learning support is required to facilitate understanding in a gradual manner, sometimes through experience-based learning tailored to each type of disability.
4. Coaching support (Coaching aid)	When riding solo in new environments, in particular, on public roads, it is important to provide support by having somebody ride next to the person to teach about the risks and responses first.
5. Enjoying cycling (Enjoying cycling)	Ingenuity in teaching the joys of cycling is gradually sought in the program, training environment, and supporting staff to maintain the participants' motivation to 'learn'.

2) Mindset required for a supporter

- What mindset is required for supporting individuals with disabilities in using bicycles?

'I interact with the participants as if I were interacting with my own family'.

(Masahiro Oshima, CVJ Cycle Volunteer Japan)

'I aim to provide a sense of security and trust through individually adapted responses'.

(Koji Nakagawa, walking trainer for the visually impaired, Ehime Prefectural Welfare Centre for the Visually and Hearing Impaired)

'I put myself in their shoes'.

(Yuriko Yariyama, Association for Enjoying Tandem Cycling in Osaka)

Tandem Support Training and Experience Workshop held at the Driver's License Centre

(sponsored by the Ehime Prefectural Sports Association for People with Disabilities, Matsuyama City, August 26, 2017).

3) Disability-specific support and cautions in using a tandem bicycle

	Support/Cautions	Measures in tandem bicycle use
Visual disabilities	・Be specific when giving instructions: 'five metres ahead to the left' instead of words such as 'here' or 'there'. ・As a guide, walk half a step ahead of the person and have the person lean on your shoulder. ・Often, people with weak eyesight or acquired blindness have experience using a bicycle.	・Have the person touch the bicycle and identify where the handle, saddle, and pedal are located. ・The pilot must sit first and get off last to support the bicycle at all times. ・The pilot must orally describe the surrounding environment and traffic or riding-related information at all times while riding.
Intellectual disabilities	・Intellectual disabilities can affect cognition and language. Therefore, such disabilities are not obvious in appearance and can make communication difficult. First, focus on establishing a relationship of trust that offers a sense of security. ・The support varies depending on the degree of the disability. Talk to individuals rather than to the whole group at once. Give simple instructions and information about the agenda, for example, and make an effort to reduce anxiety.	・ The pilot must sit first and get off last to support the bicycle at all times. ・People whose attention is easily diverted may reach their hands out or attempt to jump off the back seat of the tandem bicycle. Communicate and look around to make safety checks constantly while riding. ・People with Down's syndrome have weak muscles and can get tired easily on steep slopes.
Physical disabilities	・The type of bicycle that can be used depends on the disability. Tricycles, handcycles, recumbent bicycles, wheelchair bicycles, tandem bicycles, and power-assisted bicycles, among others, can be used.	・On a tandem bicycle, first check whether the person can maintain a sitting position. ・Take advantage of steps and differences in levels to facilitate getting on and off. ・Adjust saddle and pedal positions to facilitate pedalling and thus minimize difficulty and fatigue. ・The feet may be secured to pedals with string.

4) 'Learning' and 'enjoyment' of the cycling class program

- The cycling class program training methods are built in stages so that participants can acquire skills for this purpose. In this way, 'learning' specific knowledge or skills is not of paramount importance. Instead, we aim to build the program by emphasising the enjoyment of cycling.
- Bicycles are the first vehicles that children can drive. They grasp the handles on their own, which allows them to cut through the air to carry themselves farther away, and faster. This rapidly expands their accessible geographic space and creates opportunities to interact and communicate with new people, nature, and the community, while contributing to nurturing their thinking, behaviour, and development.
- Getting participants to experience the joy of cycling also constitutes a main component of cycling class. Training to acquire knowledge and skills is also centred on a play-and-game program that enables participants' emotions and motivations to be smoothly linked to learning while having fun.
- Children learn many things through play. They can imitate and compete by being interested and playing with others and learn to be kind to others through experience. Consideration by others (kindness) is also the basis of learning traffic rules (sociability) in cycling classes.
- Participants overcome challenges posed through in-game programs by tackling them collectively and engaging in play and fun. Having small experiences of success builds confidence. Our aim is to build fun programs according to each disability.

3. Cycling classes and cycling for children with disabilities

1) Purposes of the cycling class (experience, leisure, daily use)

- There is great individual variety in the purposes of riding a bicycle. Some use it to commute to school or work, while others use it to go shopping or to the hospital. Others may enjoy cycling on the weekend or as a sport to maintain their health.
- It is also essential to establish goals for cycling classes. For example, participants must 1) learn to ride a bicycle safely (technique), 2) know the risks and traffic rules associated with cycling (knowledge), and 3) learn how to communicate with others such as pedestrians, other cyclists, and car drivers, to ride safely (awareness) in accordance with their envisioned cycling life.
- The next section breaks down the elements of the cycling class program from the above-mentioned points of technique, knowledge, and awareness, depending on the participant's situation.

	Hints when examining the cycling class program
① **Technique**	Where? Parks, riverbeds, sports fields, driver's license centres, roads How many sessions? The program is designed in stages, based on the level of each participant. Who are the instructors? People with knowledge about bicycles and people with disabilities Who are the supporters? People who understand the characteristics of the participants and can provide technical and emotional support What equipment is required? Bicycles, tools, colour cones, and emergency and game equipment, among others.
② **Knowledge**	Who are the instructors? Policemen and women; people with experience in bicycle rules, support, and understanding of the characteristics of people with disabilities What is the content? Teaching using materials, quizzes, and illustrated stories, as well as real practice of training participants with high motivation
③ **Awareness**	How many people? Group sessions are better than individual sessions to mutually learn communication and other skills. What is the content? Kindness to others, prioritising people with challenges, safety methods, and hand signals, among others

2) Recruiting participants and preparation

- Generally, participants are recruited through networks of people with disabilities, their families, or supporters. Advertisements can be made through welfare organisations and government and the government of each community, to recruit those who are interested. It is not easily conveyed, however, so word-of-mouth is effective.
- Previous participants and others who have experienced it once may wish to start cycling with their families and friends or may want to come back to improve their abilities or travel further. Surveys should be conducted upon completion of the cycling classes so that feedback is obtained from participants on what they would like to be offered, to incorporate these modifications and additions into new programs or cycling tours.
- Preparation and preliminary inspections are important in the provision of cycling classes. Many aspects cannot be known without first visiting the site, including the existence of places for meeting and gathering, layout of the cycling course, accessibility of bathrooms, what to do in case of rainy weather, and parking spaces to load vehicles.
- When planning a tandem cycling tour, it is important to visit and check in advance locations that may be prone to accidents and intersections where crossing or turning can be difficult in large groups to plan measures. Just preparing these measures in advance increases the mental ease for organisers and volunteers and results in safety.

3) Cycling class program by disability type

- Here, we introduce an example of a cycling class program by disability type based on a program conducted in November 2017 in the Driver's License Centre (Matsuyama City, Ehime Prefecture) for children with disabilities (Main organiser: International Association of Traffic and Safety Sciences (IATSS), special joint organiser: NON-chan Club).
- The participants of this cycling class were recruited through the network from the bicycle experiencing workshops that the NON-chan Club has been holding and through publicity efforts by Ehime Prefecture. This program was held with the cooperation of the Ehime police officers as road safety instructors and local volunteers as staff.
- The type of bicycle or knowledge required depended on the disability. Therefore, the disabilities were broadly divided into three categories in the program planning: Group 1) Physical disability that prevents pedalling; Group 2) Visual disability, physical disability that does not prevent pedalling, and intellectual disability that limits autonomy; and Group 3) Intellectual disability that does not limit autonomy. However, due to the characteristics of the tandem bicycle, most of the instruction was performed individually, and instructors and supporters were assigned to each participant. The benefit of this set-up is that it allowed for individual instruction as well as shared group instruction for those with similar characteristics.
- The benefit of the single-rider-without-pedal program is that it can keep children positive and motivated and encourage them to learn while enjoying themselves. Children are professionals of play. Building various types of environments and providing them to children draw out their adaptability.

Cycling class program by disability type

■**13:00 - Reception. As many participants and their guardians arrive insecure, strive to communicate. This time is necessary to learn about the types of disabilities represented among the participants and about their personalities, to increase mutual trust.**

・Divide participants into groups by age, disability, and characteristics. (As these differences will affect what participants expect from the program, it is better to research them and divide the groups in advance.)

・Hand out the helmets, gloves, bibs, and nametags. (Instruct participants to wear helmets and gloves as safety measures for cycling. Bibs and nametags make it easier to identify participants from a distance, while calling them by name facilitates the development of a trusting relationship.)

■**13:30 - Introduction**

・Greetings, introduction of participants, agenda of the day, warm-ups
(Explain again about those who are gathered for the day's event and details of the activities so that everyone shares a common understanding. Do warm-ups to prevent injury.)

■**13:40 - Step 1: Before getting on the bicycle (explanations)**

・Group introductions (to understand who the other people in the same group are and to communicate with them)

・Mechanisms of a bicycle/Touching the bicycle/Adjusting the size (Take time to touch the actual bicycle and find one that matches the individual.)

■**13:50 - Step 2: Trial ride (practice)**

■**14:10 - Step 3: Cycling games**

■**14:30 - Step 4: Cycling together**

(Of course, it is impossible to ride a bicycle with no previous experience. Build the program to increase the difficulty level in Steps 2–4 incrementally, so that participants can progress gradually. See the table below.)

■**14:45 - Step 5: Different bicycle types**

・Try the various types of bicycles.

■**15:00 - Closing** (Return to the conference room to receive feedback and comments from participants and their guardians.)

(Participants' assessments are very important to improve and bring back participants for future events.)

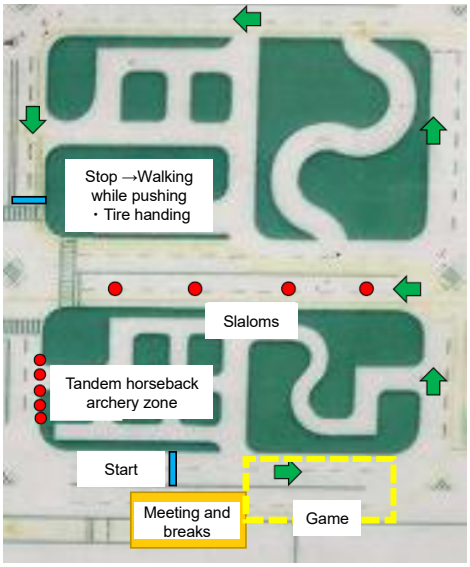
■**16:00 End**

Bicycle training contents by disability type and relationship with the required cycling task

Disability type	Program menu item name	Summary of program menu item	Cycling task required in the menu item
Common	Warm-ups	Warm-ups	
	How to ride	Instruction on how to ride and adjust the saddle	
	Traffic rules	Basic traffic rules such as how to cross an intersection with traffic lights; hand signals	
	Riding in groups	Following traffic rules and riding the course in groups	
Physical	Bubble popping	Burst bubbles with a fly swatter while riding the bicycle	Searching for moving bubbles while riding together → Ride with one hand on the handle → Moving the released hand
	Stopping	Stop before an intersection	Communicating with a driver at the required time → Hold
	Slalom	Slalom riding using pylons	Reacting to centrifugal force while riding together
	Sudden braking	Brake suddenly in front of a pylon bar	Reacting to gravitational acceleration while riding together
Visual	Log bridge	Ride straight over a rubber roll sheet	Developing balance and a sense of the road while riding together
	Sudden braking	Brake suddenly in front of a pylon bar	Reacting to gravitational acceleration while riding together
	Ring-handing	Receive a ring while riding + Log bridge + Hand a ring	Single-handed riding and balancing with the required timing while riding together
	Tandem horseback archery	Receive a bicycle tire while stopped + Ride while holding the tire + Ring-handing	Single-handed riding while riding together＋Multi-tasking while maintaining balance with the required timing (Single-handed riding＋Other manoeuvres)
Intellectual (Tandem)	Ring-carrying	Receive a ring while riding + Log bridge + Hand a ring	Single-handed riding and balancing with the required timing while riding together
	Slow race	The winner is the person who reaches the goal last without touching the feet to the ground.	Stability and balance at slow speeds while riding together
	Slalom	Slalom riding using 4 pylons	Reacting to centrifugal force while riding together
	Hand signals	Right and left turns; stopping	Single-handed riding while riding together
	Passing under a sheet	Pass under a wave of sheets	Changing upper body positions while riding together
	Tandem horseback archery	Receive a bicycle tire while stopped + Ride while holding the tire + Ring-handing	Single-handed riding while riding together＋Multi-tasking while maintaining balance with the required timing (Single-handed riding＋Other manoeuvres)
Intellectual (no Pedalling)	Solo training	Straddle the bicycle and move the feet → Release one hand and move the feet (left and right) → Raise both hands and move the buttocks	Balancing while riding on one foot; correct seating position and vehicle control in the seated position
	Ring-handing	Receive ring + hand ring	Kick-riding ＋ Stopping ＋ Consecutive manoeuvres with one hand released
	Musical chairs	While free riding, place the front wheel on the ring of the designated colour when the tambourine stops	Look for the required colour in the surroundings → Manoeuvre the vehicle → Place the front wheel in the appropriate position
	Slalom	Slalom riding using 4 pylons	Handle manoeuvres on a curve＋Balance
	Sudden braking	Make a sudden stop in front of the pylon bar	Stopping with the required timing
	Kicking off	Kick off with movement and raise the feet	Advance forward with balance without touching the feet to the ground
	Ball dodging	Dodge colour ball obstacles thrown at the slalom	Riding while dodging obstacles with various timing
	See-saw	Go over a seesaw	Understanding the differences between how to go up and down
	Passing under a sheet	Pass under a wave of sheets	Changing upper body positions while riding

4) Ways to enjoy cycling according to disability: Tips
（Tips and cautions, examples, course introduction）

The types of activities people with various disabilities and characteristics can do are still not well understood. It is best to consult the instructor and follow several tips. This section presents the program menu items in which each group participated.



Biking class course (Example)

【Common】

Going over cautions with the pilots.

Experiencing hand signals

【Physical】

Pedal and stop on a handcycle

Bubble popping

【Visual】

Tandem horseback archery: slowly in synchrony

Two-level right turns on tandem

Three-people bicycles are fun too

【Intellectual (no pedalling)】

Riding under a sheet on a kick

‘Cannon ball’: dodging balls

Crossing an intersection on kick

Kicking off

5) Effects of the cycling class program by disability

- Here is a summary of the effects of the cycling class program by disability, as surveyed by a questionnaire distributed upon completion of the Cycling Classes for Children with Disabilities held in November 2017, at the Driver's License Centre (Matsuyama City, Ehime Prefecture), organised by the IATSS and co-organised by the NON-chan club.

① Questionnaire summary

Three types of questionnaires for participants, guardians, and instructors were prepared. The questions and numbers of responses are shown in Table 1 above.

Table-1 Survey types and numbers of respondents

	Participants	Guardians	Instructors
Participant characteristics	4 questions	6 questions	
Behaviours related to outings in daily life	5 questions		
Bicycle use		7 questions	
Disability and bicycle use	2 questions		
Assessment of the bicycle class	6 questions		
Experiences related to education received	6 questions		8 questions
Perceptions of education			4 questions
Initiatives in education			8 questions
Future views on how classes should be	4 questions	4 questions	
Total number of questions	27 questions	17 questions	20 questions
Number of respondents	2 cases	20 cases	5 cases

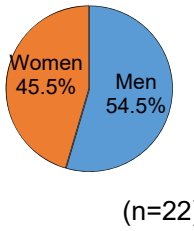


Figure 1 Participants' Sex

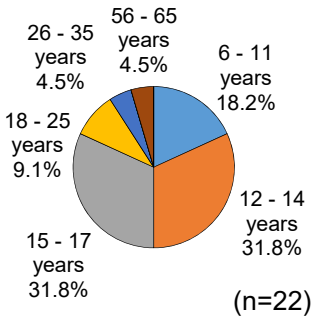


Figure 2 Age of the participants

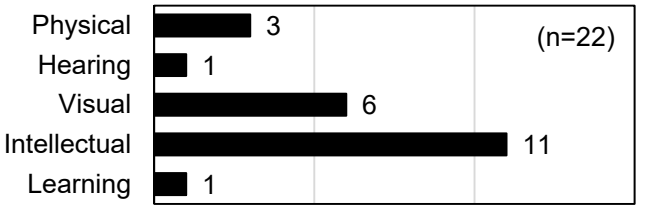


Figure 3 Participants by Disability type

② Participant characteristics

There were 22 participants, of whom 82% were under 18 years of age (Figs. 1, 2). The number of men and women was nearly equal. Intellectual disabilities comprised the largest number of participant disabilities (11) (Fig. 3). While 50% of participants had severe disabilities, as declared by their guardians (extremely severe/severe/moderate/mild/extremely mild), 50% of the 20 guardians (of whom one was a caretaker) were men, and 80% of them 'always' or 'almost always' accompanied the participants during outings.

③ Preliminary assessment of participants by guardians

Guardians believed that their children's disabilities affected their cycling ability. Most of the reasons cited by these guardians included physical disabilities, lack of physical abilities and judgment, and cognitive function for memorizing traffic rules, among others.

④ Effects of the program

The event included training for children with disabilities, and they were able to try various bicycles with their guardians. The results showed that the proportion of guardians who believed that it was not desirable for their children with disabilities to go out on bicycles alone in the preliminary survey decreased dramatically. After participating in the event, the percentage of guardians who believed that it was desirable for their children with disabilities to go out on their bicycles alone increased to 90%, including those who answered that it was desirable only for leisure purposes (Fig. 4).

This result reflects that guardians were able to experience and realise that impacts of disabilities could be overcome using two-rider bicycles or with a co-rider's support and that their physical abilities could improve with training, despite the disability.

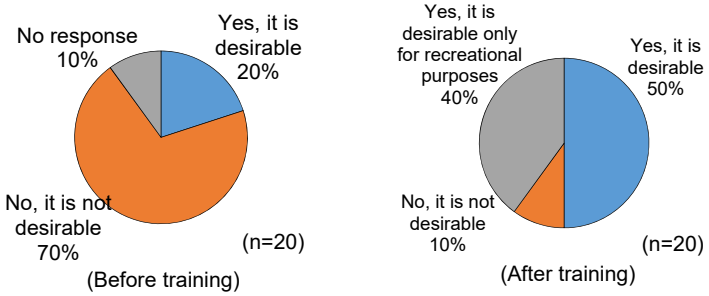


Fig. 4 Desire for the children to go out on bicycles alone (before and after training)

6) Program at Nara Nishi Yogo Gakko (special education school for intellectual disabilities)

Program schedule:

December 12: Rehearsal for teachers (teachers' trial participation and feedback)

December 13: 1st bicycling class (trial, assessment, improvement)

January 18: 2nd bicycling class (trial of the program modified by taking the 1st session into consideration)

March 1: 3rd bicycling class (program run by the school teachers for further improvement)

Target students:

Ten students in two classes of 5th graders in elementary school (approximately one teacher for two students)

Disability type: Intellectual, developmental (Down's syndrome, autism spectrum disorder, etc.)

Program menu:

1st (12/13)	2nd (1/18)	3rd (3/1)
Ice breaker Ball collecting Ring-handing Instrument playing Musical chairs	Ice breaker Ball collecting Instrument playing Musical chairs	Ice breaker Dancing (Routine event)
Course bicycling Rubber rolls Slalom Bumpy roads Slope See-saw	Course bicycling Rubber rolls Slalom Bumpy roads Slope See-saw	Course bicycling Rubber rolls Slalom Bumpy roads Slope See-saw
Additional events Ball dodging Passing under a sheet	Additional events Ball dodging Passing under a sheet	Additional events Ball dodging Passing under a sheet Level crossing

Comments from the school and teachers:

- Students with communication and memory disorders (i.e. students who normally forget past activities) came up to the teachers the following day to ask, 'What about the bikes?'
- Students were all able to follow the instructions of the lead teacher without individual assistance from other teachers.
- Surprise at the brightness of the students' facial expressions
- Once out on the field, the students began to get on the bicycles without the teacher having to say anything.
- A student who was unable to ride a pedalled bicycle was able to ride it alone after training with the teacher, giving him the experience of success.
- The range of interests broadened for a student who previously only showed interest in singing.
- Visible changes are rare in children with disabilities in special education schools. Teachers therefore try to find moments in which students are making an effort and compliment them, no matter how small the accomplishment, to build their self-esteem. Students are able to gain a sense of achievement and enjoy themselves with this bicycling program. These positive effects are visible for the teachers as well, which motivates them to join, participate, and work together with the children.

○ **Naranishi Yogo Gakko** HP (QR code) : http://www.nps.ed.jp/naseiyou/

1st session PDF：http://www.nps.ed.jp/naseiyou/syou/2019_01.pdf

2nd session PDF：http://www.nps.ed.jp/naseiyou/syou/2019_02.pdf

3rd session PDF：http://www.nps.ed.jp/naseiyou/syou/2019_3_3.pdf

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7) Training Staff and their Roles

- A cycling class on tandem bicycles requires staff to take on the following roles: ① MCs who explain and lead the program; ② pilots who sit on the front seat of the tandem bicycle; and ③ administrative staff who handle reception, giving information and guidance.
- The roles and training for pilots are introduced here.

Before riding in two, the pilot practises riding alone to grasp the vehicle length, and tries the brakes, the handle, and gear shifting.

A relationship of trust between the two riders is important. The front rider and the back rider must trust each other.

Please ask questions about the disabilities or biking experiences of the person with disabilities sitting in the back.

Which foot should be used to kick off? The bicycle is a vehicle which stabilises with movement. Keep pedalling!

Communication is essential. Keep talking to start, turn, go up and down slopes, stop, warn about any foreseeable changes, and talk about the scenery.

The person in front gets on first and off last. Falling occurs when the two riders dismount from opposite sides.

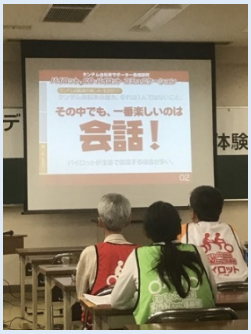
Encourage each other to stay relaxed. The pilot should look forward, not down. The first five metres determine your success.

Example）Tandem bicycle supporter training workshop in Ehime Prefecture Driver's License Centre

(August 26, 2017 (Sat.) Organised and held by the Ehime Prefectural Association of Sports for People with Disabilities)

- The workshop was held by the NON-chan Club（Matsuyama City）to allow pilots and co-pilots (person who rides in the back seat) to experience traffic rules and riding techniques.
- The workshop covered traffic rules, understanding and responses to disability characteristics, the mindset of giving support, role of the pilot, understanding bicycle performance, and communication between front and back-seat riders (theory), after which participants actually rode tandem bicycles (practice).

Scenes from the workshop



Learning from experts

Experiencing a narrowed visual field

Tandem bicycle trial

4. Experience accounts and examples

1) Voices of participants with physical (limb), intellectual, and visual disabilities

2) Voices of families who participated in cycling classes (excerpt from NON-chan Club vol. 4, p. 18)

◎We participated without [my child] understanding anything other than that we were going to ride bicycles. [My child] was very anxious and already wanted to go home at the initial reception, but later, a staff came and greeted us and stayed with [my child] the whole time. Thus, [my child] managed to feel secure and participate in the activities because there was someone around whom he/she could depend on, despite having been separated from his/her mother [which makes him a baby]. As [my child] loves cycling, I was able to see [him/her] smiling and enjoying the activity to the end.

◎Although my son loves cycling, it has many challenges, such as controlling it safely, shifting gears and following traffic rules. Sometimes he goes cycling with my husband and I, but we cannot do it often. I am hoping that he could acquire more abilities if we increase our cycling. Events like this allow us to ride bicycles and enjoy it with many other people. It seemed that what the instructors had to tell us came into our ears smoothly. We hope to participate again if we have the opportunity.

◎My daughter has a hard time with balance, even though she had practised cycling when she was small. I remembered how she got very scared whenever the bicycle shook from side to side, even with trainer wheels. The present cycling classes allowed her to straddle a no-pedal bicycle alone to practice. It may take a long time, but it made me realize that she should keep trying without giving up, even if it may take time. […] I hope that, in the future, the environment will be more adapted so that children with disabilities can enjoy bicycles, too.

3) Voices of staff and supporters

I felt that ring-handing was appropriate for the initial warm-up, especially to initiate communication by asking whether they were right- or left-handed.

It is fun to invent various games using the tandem bicycle. I also thought that more ideas could come up by discussing with visually impaired individuals how sounds can be used effectively.

I am studying special needs education and thought it would be better to have knowledge of bicycles. There are many intellectually disabled people nationwide, so I believe jobs for instructors of intellectually disabled people are necessary. I believe it is important to check things that we take for granted, so education on traffic safety is needed.

As an instructor of disabled people, I asked in advance about the difficulties they face in everyday life and their previous biking experiences to determine whether or not they could ride a bicycle.

Training was given by dividing participants by disability type, so the menu was designed in a step-by-step manner. The instructor job should be recommended for all disabilities.

4) Voices of people who have started to use tandem bicycles regularly

A father and son participated in the tandem bicycle cycling tour. After the event, they bought a bicycle and toured the Shimanami Kaido (bay street). The father sent us a message, ‘It was a tour of a total of 100 km or so. It was extremely fun, but my butt hurt (lol)’. (2015)

Elementary, middle, and high school students participate in the afterschool day service ‘Jagaimo Club’ (Shono district, Osaka city). Two tandem bicycles are used for transporting children and for recreation. The children love it too ‘because they can pedal’. They are free to take detours as well: a staff member commented, ‘I learned that just adding one option can enrich life so much’.

5) Examples in Japan

(1) NON-chan Club

Purpose : Realising an emotionally barrier-free society through the tandem bicycle

Location : Nishiki-cho, Matsuyama City, Ehime Prefecture

Representative: Kaoru Tsuga

FB : https://www.facebook.com/tamdemnonkaoru0801

Three Pillars of the Non-chan Club

1. "You can be my eyes and I can be your legs." The spirit of mutual assistance, a legacy of the founder Non-chan.
2. Don't become insensitive to the miracles of life! Our job is improving the quality of life, not just delaying death. The message on life from the movie, "Patch Adams."
3. Where do you draw the line around disability? A quote from Dr. Glenn Doman

Current Activities (2–17)

- Presentation by Satoshi Inoue: 'Challenges to Living Life' (2/26)
- It's Spring! It's Hanami season! Tandem bicycle cycling (4/1)
- Cycle Challenge 2017 in a Cycling Stadium (6/4)
- Tandem Biking, Sea Kayaking, and Salt Water Bath in Akihama (7/2)
- Enjoying Tandem Biking and Water Bicycles in Monchicchi Bay (7/30)
- Tandem Supporter Training and Experience Workshop (Ehime Prefectural Association of Sports for People with Disabilities) (8/26)
- Shimanami Cycling (Association of Sports for People with Disabilities) (9/24)
- Shimane Prefecture Tandem Biking Safety Workshop (10/1)
- Wasshoi Bicycling! Hinomaru Kids (10/8)
- Prefectural Residents Recreational Event Tandem Bicycle Trial Workshop (11/12)
- IATSS in Driver's License Centre（11/25）
- IATSS Forum in Community Centre (11/26)
- Bocchan Lan lan lan　Tandem Bicycle Trial Workshop (12/2)
- Publication of 'Tandem Bicycling Non-chan Club vol. 4' (3/17)

(2) NPO Organisation Cycle Volunteer Japan

Credo: 'Spreading the joy of cycling to many people'.

Cycling is a sport that broadens and builds enjoyment of life. CVJ's activities are aimed at contributing not only to enjoying cycling alone but to spreading this joy to many others and contributing to society through cycling.

Established: May 2008. Registered as a specified non-profit organisation (NPO) in November 2012

Location: Branches in Kanto and Kansai regions

FB : http://cvjapan.org/wp3/

Main Activities

1. Cycling Day-Trip Activities to Enjoy the Season
2. "*Fureai* (Friendly Exchange) Cycle Event" Activities
   (One-night cycling events with people with disabilities)
3. Overseas Runs: International Exchange
   in Spain, South Korea and Taiwan
   Ex: Taiwan(Exchange with organizations of people with visual and physical disabilities)
   Taiwan side: Choir cum Visually-Impaired Wings Angel Cooperation Team
   (Tandem bicycle use for people with visual impairment)
   Life Vitality Association (Handcycle use for people with lower limb impairment)
4. Philanthropic Activities through the Bicycle

(3) The Club for Enjoying Tandem Cycling in Osaka

Purpose: Riding the ecologically friendly and fun 'tandem bicycle'

Established: Start of activities in 2009; inaugurated as an association in 2012

Cooperating organisations: Cycle Volunteer Japan (CVJ), Association of Bicycle Culture Town Building, Bicycle Japan, Nippon Lighthouse Welfare Centre for the Blind, The Aozora Foundation

Location : The Aozora Foundation (Office)

1-1-1, Chibune, Nishiyodogawa Ward, Osaka, Osaka Prefecture

HP : **http://www.tandem-osaka.com/**

FB : **https://www.facebook.com/osaka.tandem**

Main Activities

Touring (720 total riders in 2016)

Presentations and study groups

Pilot training

Presentations and study groups

Scenes from the Tandem Bicycle Trial Workshops

・Preparation: tandem bicycle maintenance, pre-riding by pilots, wearing gear such as helmets, going to the bathroom

①Explaining how to ride a tandem bicycle

②Choosing pilots and bicycles depending on body size and experience

③Start! Look forward and pedal!

④Taking a break halfway

6) Examples Abroad

① Inclusive cycling in the Netherlands

Mr. Berry (Berry den Brinker) from the Netherlands was a former bicycle racing athlete. Although his vision has declined to 0.03 today, he continues to ride.

He conducts surveys and research on bicycle use by individuals with weak eyesight in the Netherlands, incorporating his own experiences.

For example, he researches and gives proposals on roads and signs for safe bicycle riding, along with topics on vision required for using a bicycle.

*Scientific Institute for Low Vision Research (SILVUR)

Anybody can bicycle safely as long as the conditions are met.

The importance in training children to ride alone outside is for parents to ride with their children first, and to teach and give them confidence as problems come up.

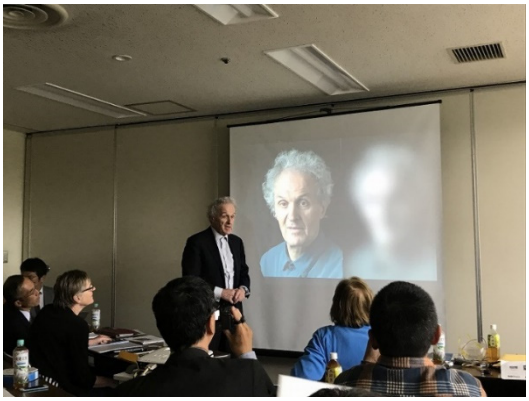


Photo: Mr. Berry at a presentation

The main priority is to increase understanding about disabilities.

Practice makes perfect.

It is up to each person to determine whether they can do something or not, not for others to draw the line.

Quoted from his presentation at the International WS (2017.11.26)

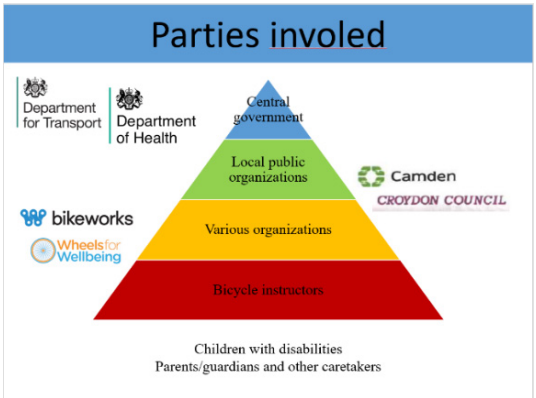
② Inclusive cycling in England

(Pola Berent, University College London, from materials in November 2017)

In Britain, it is believed that 'transport is a common barrier that limits access to work, healthcare, and social life for people with disabilities'. Inclusive cycling is considered important among the benefits of biking, which include health benefits, wellness improvement, free door-to-door transport, options for transport, and autonomy.

Wheels for Wellbeing is a charitable organisation established in 2007 which supports people with disabilities of all ages who benefit from cycling. Inclusive cycling sessions are held in four locations in South London, using many types of adaptive bicycles and catering to the needs of people with a wide range of disabilities.

Website: https://wheelsforwellbeing.org.uk/



③ Inspection and Workshops in London, England

- Watching biking experience sessions for people with disabilities

  We observed a bicycling experience session for people with disabilities by the English NGO Wheels for Wellbeing and exchanged opinions with instructors on how classes are operated.

  Date and time: September 10,
  (AM: Inspection, PM: Opinion exchange)

  Location: London suburb (Herne Hill)

  Participants: 20 people with disabilities, 5 instructors, researchers, and practitioners from Japan and the Netherlands

  Principal opinions exchanged: Bicycles adapted to disabled people and how to use them; day of the bicycle riding educational program

Bicycling experience session for people with disabilities


Discussion session

- Summary of Japan-Netherlands-England International WS on operating bicycling classes for people with disabilities

  Date and time: September 11

  Location: University College London

  Participants: Representatives from the English Department for Transport, local government, and 40 researchers and practitioners from Japan and the Netherlands

  Presentation:

Topic	Presenter
Inclusive Cycling in Japan	Nagahiro Yoshida, Osaka City Univ.
Cycling education for children in the Netherlands	Divera Twisk, Queensland Univ. of Technology
The role of 'training' in inclusive cycling provision	Nick Barrett and Mark Crouch, Wheels for Wellbeing
Do planners imagine disabled people as potentially cycling in London? An analysis of transport and cycling strategies	Rachel Aldred, Univ. of Westminster
Cycling training for people with visual impairments in the Netherlands	Bart Melis-Dankers, Royal Dutch VISIO
Investigating Cycling by Elderly People in Japan	Takao Yanagihara, Kindai Univ.
Inclusive cycling training and activity sessions in the UK: Perspectives of disabled people, their parents and carers, and cycling instructors	Pola Berent, University College London
Running Inclusive Cycling Activity Sessions in Japan	Itaru Fujie, Aozora Foundation

  Discussion

  Methods for promoting and expanding the use of bicycles by people with disabilities
  Assessing degree of disability and ability to use bicycles
  How to teach road safety in experience sessions focusing on enjoyment

  Knowledge obtained:

  - To ride a bicycle on a public road, it is important not only to be able to ride a bicycle but to be able to select the routes with awareness of one's own abilities and road conditions.
  - In England, the main interests of participants were to exercise and interact with other people. That is, improving bicycling technique was not the main purpose. Bicycling class programs should be built with such findings in mind.
  - Many parents and guardians were supportive of their children with disabilities' participation in bicycling classes but were hesitant for them to bike by themselves on public roads (requiring parent/guardian support).
  - Showing the path toward what participants may be able to learn by coming to the next bicycling class is important to lead participants to the following step.
  - Bicycling class organisers need to network with others in the same trade as well as government and public health organisations.

7) Progress in research and surveys

① Interests and challenges associated with the daily use of tandem bicycles by people with reduced mobility

・Background and Purpose

For persons with reduced mobility (PRM), the tandem bicycle is a potentially practical means of transportation. However, there are limited Japanese prefectures that allow its use on public roads. It is also not well known as a means of transportation for people with disabilities. Furthermore, there is little knowledge about the needs in terms of its daily use or challenges associated with transport. Therefore, the purpose of this study is to analyse the needs and challenges associated with the daily use of tandem bicycles by PRM and to obtain findings that make tandem bicycle use feasible.

・Methods

Participants underwent trial and experience sessions of events organised or co-organised by The Group for Enjoying Tandem Cycling in Osaka and members of supporting organisations of people with visual disabilities, bicycle town-building related organisations, and bicycle fan organisations. The Questionnaire Survey on Tandem Bicycle Use was conducted, and 117 responses were obtained. The questionnaire consisted of nine questions on individual characteristics (for all respondents), one question on whether or not the respondent has ever used a tandem bicycle (all respondents), 16 questions for people who have already used a tandem bicycle, four questions for people who had never used a tandem bicycle, and seven questions on possible future uses of tandem bicycles (for all respondents).

・Summary of Survey Results

Among respondents, 68% were men, and 32% were women. Respondents aged 19 years or younger; 20–40 years; 41–64 years, and 65 years and older represented 3%, 26%, 52%, and 20% of respondents, respectively. A total of 85% of respondents had experience in riding a tandem bicycle, and 31% of respondents had disabilities, of which total blindness, weak vision, and non-visual disabilities accounted for 21%, 5%, and 4%, respectively. A total of 57% of respondents without disabilities had experience in riding a tandem bicycle, 27% had disabilities but no experience in riding a tandem bicycle, 12% had no disabilities and no experience in riding a tandem bicycle, and 3% had disabilities and no experience in riding a tandem bicycle.

・Results

While most respondents who had only ridden a tandem bicycle once answered that they felt ‘somewhat safe’ during the ride, few people who had ridden it multiple times felt insecure (Fig. 1). As a mode of transportation, the tandem bicycle may potentially widen the person’s accessible geographic area as a substitute for walking or taking a bus with a guide. A higher proportion of people with disabilities have higher levels of interest in tandem bicycle for daily use (Fig. 2) than those without disabilities.

・Future objectives

Increased accessibility of the riding environment, manuals for safe riding on public streets, and pilot workshops are some of the future objectives to enable PRM to use tandem bicycles as a mode of transportation.

(Yoriko Yariyama, Nagahiro Yoshida, Toru Fujie: Interests and challenges associated with daily use of the tandem bicycle for people with reduced mobility, Abstracts of Conference Presentations of the Kansai Branch of The City Planning Institute of Japan, Vol. 14, pp. 101–104, 2016.)

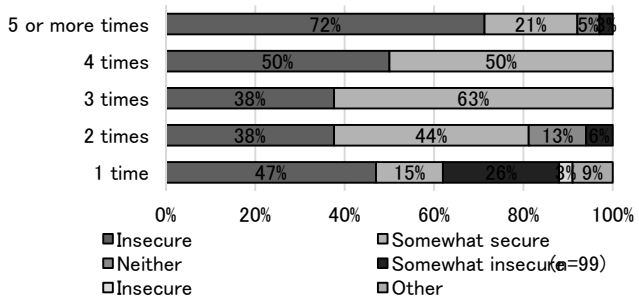


Fig. 1 Security or insecurity while cycling by number of times experiencing a tandem bicycle

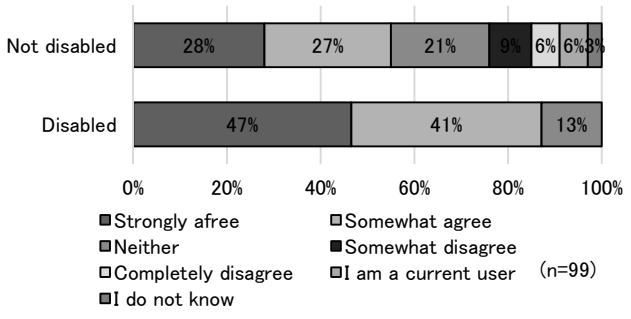


Fig. 2 Level of interest in tandem bicycles for daily use by presence or absence of disabilities

② Latent opportunities for the use of two-rider bicycles and associated challenges based on assessments of their use by people with reduced mobility

・Background and Purpose

Certain mothers of adults or young children with disabilities have expressed an interest in a bicycle that can be ridden by two people, and the development of bicycles that meet these needs is in progress. At the same time, there are many limits imposed on their individual and business use, and the opportunities for use and challenges remain unclear. Thus, the purpose of this study was to elucidate latent opportunities associated with the use of two-rider bicycles by people with difficulties, their families, and welfare service providers, as well as the associated challenges.

・Methods

A hearing survey was conducted on welfare service providers (e.g. day care providers, afterschool, visiting long-term care, and guide helper services) that operate transportation services for the elderly and people with disabilities to investigate the following topics: first, to research the realities with respect to outings during service provision and second, to investigate the opportunities for using a two-rider bicycle. The hearing survey consisted of five items on organisational characteristics, five items on user characteristics, and six items on the presence or absence of current challenges and their details, as well as the scenarios of bicycle use.

Furthermore, we enabled individuals with limited mobility, their families, and welfare service providers to experience two-rider bicycles (i.e. tandem bicycles and tricycles with frontal seats) and conducted a questionnaire survey. 77 responses were received totally from drivers and passengers, who revealed the latent opportunities associated with using two-rider bicycles by type of difficulty for going out, along with the associated challenges. The questions included four items on individual characteristics, five questions on daily outing-related behaviours, four questions on bicycle performance, and five questions on intentions of using or owning a bicycle. The questionnaire was designed so that the difficulties of the passenger could be understood from the driver's response in cases in which the passenger's disability or other difficulty limited his or her capacity to respond to the questionnaire.

・Results

The results confirmed that there are latent opportunities for the use of two-rider bicycles by welfare service providers, as they can be used for small-scale welfare service businesses that provide transportation as part of their services. The results also confirmed that even welfare service providers that do not offer transportation had needs for recreational purposes for routine outings and other uses, as per users' interests. On the other hand, there are many systemic challenges such as insurance and indemnity liabilities for welfare service providers as well as challenges associated with the environment of use such as parking space (Table 1).

The study confirmed that there is a level of interest in using two-rider bicycles by people who have difficulty going out. Furthermore, people with an inability or difficulty to walk tend to be interested in using frontal-seat types for routine outings, while people with visual disabilities tend to be interested in using the tandem type for recreational purposes.

・Future objectives

Learning about traffic safety is a requirement for the use of bicycles by people who have difficulty going out. However, the type of education required for passengers assuming the use of a two-rider bicycle is unknown. Furthermore, the majority of tandem bicycle users in Japan are people with visual disabilities. There are few cases of its use by people with other disabilities, or cases of use of other types of bicycles. The latent benefits of its use in everyday life are still unknown.

(Takuya Konishi, Nagahiro Yoshida: Latent opportunities for two-rider bicycles based on assessments by people who have difficulty going out and associated challenges, Japan Society of Traffic Engineers Conference, No. 115, pp. 731–735, 2018)

Table 1　Opportunities for the use of bicycles by welfare service provider type and associated challenges

Welfare service provider		(Afterschool) Day services	Visiting long-term care	Guide Helpers
Interests in use by welfare service providers		Transportation, Routine outings	During visits, Routine outings	During accompanied outings
Interests/purpose for use by welfare service users		Recreational purposes	Routine outings Recreational purposes	Routine outings Recreational purposes
Interested purpose for use by welfare service users	**Common challenges**	[Vehicle] -- Poor weather conditions	[Systemic] -- Insurance system, indemnity liabilities -- Additions for transportation	[Environment of use] -- Parking space
	Individual challenges	Limited number of people who can be transported	Bicycle parking at the visit destination	Designation of daily use tools and equipment

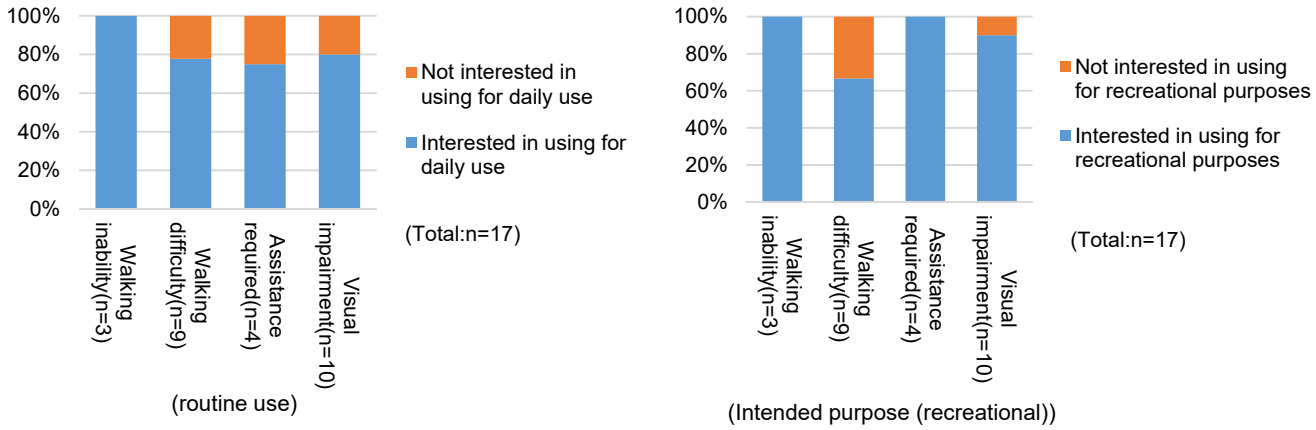


Fig. 3 Purposes of the use of bicycles by type of reduced mobility for going out

5. Variety of bicycle types

1) Tandem bicycles, handcycles, bicycles with wheelchairs

Two-wheeled power-assisted

Four-wheeled power-assisted

Three-wheeled handcycle with wheelchair

Three-wheeled handcycle for sports

Two-wheeled power-assisted (kushi)

New three-wheeled power-assisted (for two adults)

Old three-wheeled power-assisted (for two adults)

Three-wheeled bicycle with wheelchair

KHS tandem

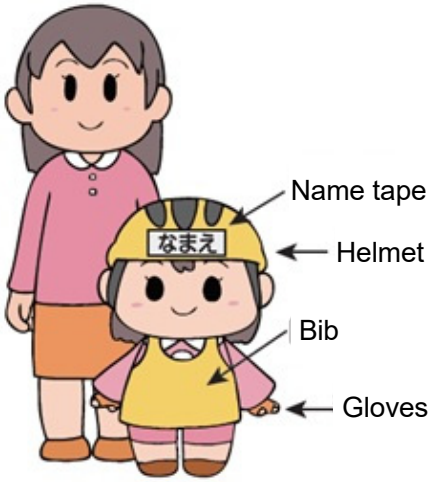
KHS tandem (SP)

Tandem (three riders)

Double front-wheel tandem

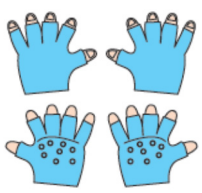
2) Useful items for cycling classes

(From the Citizen's Cycling School Project Panel)



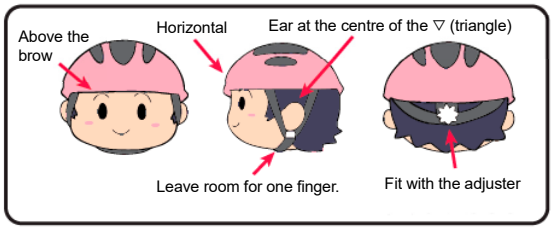
A name tag worn on the front of the helmet makes it easy to call participants by name.

Bibs for division into teams



Gloves to prevent injuries

How to wear a biking helmet



6. Conclusion (messages from special researchers abroad)

① Pola Berent (University College London)

Over the last three years, I have collaborated with IATSS as a lead researcher looking into the delivery of inclusive cycling training in the UK and the Netherlands. The research identified main strengths and challenges to making cycling more inclusive, from the perspective of those in charge of the delivery (central government, local authorities, NGOs) as well as parents/carers and people with disabilities.

In September 2018, together with IATSS and Wheels for Wellbeing, we organised The International Workshop on Delivering Cycling Training and Activity Sessions for Disabled People. During the workshop, the 'Guide for Bicycle Use by Children with Disabilities' was presented, receiving a lot of attention and interest from the attendees, who included representatives from transport and disability organisations (Sustrans, Department for Transport, Wheels for All, Bikeworks, etc) and cycling instructors. The reception of the document was very positive, with multiple attendees emphasizing the need for more resources to assist cycling instructors and facilitate delivery of more structured training sessions.

As a cycling researcher and as a person who has worked directly with people with disabilities over the years, I have learned that there are many presumptions about disabled people and their ability to cycle. There is often a lack of confidence, even among cycling instructors, parents and carers, and people with disabilities themselves (usually owing to a lack of knowledge). However, once this barrier is overcome, cycling can be a great way to stay active, socialise, and maintain independence. I believe that an easily accessible guide based on academic research and understanding of different impairments, filled with practical solutions and case studies, is essential and will provide the background knowledge to change such attitudes. It is the key to supporting the delivery of inclusive cycling training and, as a result, a more inclusive society.

② Bart Melis-Dankers (Royal Dutch Visio)

Mobility is very important for social participation. This holds also for people with disabilities. Mobility allows us to meet people and to enjoy the world. Cycling, either for leisure or for transport, is, in fact, an accessible means of mobility: It's healthy, it's cheap, and it's fun. Of course, it has to be safe, too. Scientific research has shown that safe and responsible cycling is possible if one is capable of compensating for one's individual impairment. There are many, many ways to compensate for an impairment, for instance, by choosing the right type of bicycle, by using a tandem, by choosing the optimal road position, by adapting speed, by keeping one's distance from other traffic, and by choosing a safe route. The younger children are when they learn to cycle, the better and more confident they and their parents will become. The opportunity to use a tandem bike is very important, especially if one is not able to bike independently because of an impairment. Therefore, tandem bike riding should be allowed everywhere.

The IATSS Guide for Bicycle Use by Children with Disabilities is a very useful tool for disabled people and their peers to explore the possibilities of cycling. Learning to cycle requires tailor-made support to fit the specific disability as well as confidence and enthusiasm. This comprehensive guide provides a great number of useful and structured suggestions for disabled potential cyclists as well as parents, coaches, and teachers. Working in groups and stressing the fun factor are strong items in their approach, directly related to the relevance of cycling for social participation in life. An inclusive society requires free mobility for everybody, regardless of any disability. This guide truly helps to overcome possible hurdles and make cycling a great experience for everybody.

③ Divera Twisk (Queensland University of Technology)

It has long been recognised that access to a variety of mobility options contributes to the integration and well-being of persons with physical or intellectual disabilities and to their mental and physical fitness [1]. Recently, grassroots organisations have started promoting cycling as such a mobility option. With the innovations in specialised bicycles to overcome physical limitations and the implementation of safe infrastructure, cycling may become increasingly safe and comfortable for this user group as well [2].

Still, many may not be aware that they may be able to cycle, despite their disabilities. Road shows where the public can try a wide variety of specialised bikes may help potential cyclists to find 'their' bicycle and to develop their cycling skills. It is expected that the demand for specialised bicycles and the need for such road shows will increase in our ageing society, with elderly cyclists requiring extra facilities to overcome age-related loss of function. Electric bicycles serve as an illustration of the benefits provided to this age group may [3, 4] as well as bicycle types that may reduce the high incidence of injury due to falls [5].

One other barrier is the confidence of caretakers about their disabled child's ability to learn to ride a bicycle. The IATSS program in Japan in which young children are introduced to cycling in the presence of their caretakers will assist in overcoming that barrier. The smiles on their faces as they master the essential cycling skills are worth a thousand words. Further, research on minimal requirements, for instance, in terms of 'vision' and standards of infrastructure, [6] may push the boundaries and lead to higher cycling participation than is currently the case and may ensure that fewer children miss out on the benefits of cycling and the joy of cycling with their peers to school [2, 7].

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2. Clayton, W., J. Parkin, and C. Billington, *Cycling and disability: A call for further research.* Journal of Transport & Health, 2017. **6**: p. 452–462.
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4. Boele-Vos, M.J., J.J.F. Commandeur, and D.A.M. Twisk, *Effect of physical effort on mental workload of cyclists in real traffic in relation to age and use of pedelecs.* Accident Analysis & Prevention, 2017. **105**: p. 84–94.
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About this guide

This is the guide that was created as one of the achievement of Research project [1822] ” regional operation of Bicycle Education Program for People with Disabilities Using Inclusive Cycling Guide” organized by International Association of Traffic and Safety Sciences in 2018.

The aim of this guide is to further inspire new initiatives to promote universal bicycle use in various communities.

1822 ” regional operation of Bicycle Education Program for People with Disabilities Using Inclusive Cycling Guide”

Project member

As of March, 2019

	Name	Affiliation
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	Yukako Nakano	Second Traffic Science Section, Department of Traffic Science
	Yoriko Yariyama	The Aozora Foundation Center for the Redevelopment of Pollution-damaged Areas in Japan
	Michiko Matsumura	IATSSA advisor, Town Creater
	Takuya Konishi	Osaka City University Graduate School