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READY-RIDE: A TACTILE COMMUNICATIONS AID TO IMPROVE THE MOBILITY OF PERSONS WITH DEAFBLINDNESS IN A RIDING ARENA

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ABSTRACT

Persons with severe visual impairment (VI), blindness (B) and deafblindness (DB) have difficulties in mobility and thereby poor leisure time. Activities as horseback riding become difficult especially for persons with DB who communicate with an assistant/instructor via tactile sign language and need to stop and get information/feedback.

Ready-Ride, a tactile communications system can improve the mobility of the persons with B and DB by making distance communication possible. It consists of transmitter with four buttons which communicates via Bluetooth with a receiver connected to four vibrators via cables. The button(s) are used to activate the specific vibrator(s). The messages can consist of simple "right" or "left" or more complex codes for any needed instruction.

Ready-Ride has been evaluated in the riding arena by persons with B and DB who consider it as mobile, easy to use and no need for long introduction or installation of any software/hardware. The vibrations are intuitive, easy to detect and distinguish. The system gives the rider information tactually without disturbing other persons or horses nearby. Using Ready-Ride they got more time to ride and the quality was increased since they could communicate while riding and get immediate feedback directly.

One of the riders with DB has been using the system during a long period, in average one lesson a week and participated in different competitions with good results. She says that the use of Ready- Ride is crucial for continued riding, "Ready-Ride is a MUST BEE".

Keywords: Blind, Deafblind, Riding, Riding arena, Tactile aid, Vibration

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1. INTRODUCTION

A good leisure requires that the person can easily move around and communicate with others (in the area). Many people with severe vision impairment (VI), blindness (B) and particularly deafblindness (DB) have difficulties moving around freely and conduct leisure activities since they are afraid of making damages or injuring themselves [1]. Many of them also have cognitive disabilities and poor body perception (having difficulties with right and left) therefore they must be informed extra clearly. These people are dependent on an assistant (instructor, interpreter, teacher, coach, or relative) who must walk close to the person (length of an arm) and inform them tactually, for example clap on the right arm to say turn right, to warn about a water puddle or a branch in the road. Assistants usually give the information in form of abbreviations or symbols instead of sentences. The problem is that assistants are not always available, and in some situations it may be difficult to have an assistant next to them, on narrow roads, in a shop with narrow passages between shelves, or when performing activities as cycling on a tandem bike. The problem is greater when conducting activities e.g. riding where timing is important and information is provided via interpreters causing information delay.

Horseback riding is the largest handicap sport in Sweden and is often used for rehabilitation purposes [2-5]. Riding in a riding arena requires continuous information about the changes of direction. Fixed positions in the arena are marked by letters, being used to communicate the position with an instructor thus getting guidance and feedback (see further under section Method). Riding can improve the balance of children with Cerebral Pares (CP) injury and used as alternative treatment of people with knee disease [2- 8]. Studies have also shown that therapeutic riding has a positive effect on children with Attention Deficit Hyperactivity Disorder (ADHD), regarding their social behavior and quality of life [9]. Children with VI that tend to walk with their head bent forward may strengthen the muscles around the neck which reduces neck pain [3, 10]. People with severe Hearing Impairment (HI)/VI, deafness (D), and B often ride. Those with HI can use vision to compensate for the lack of hearing, and those with VI can use hearing to compensate for the vision loss when navigating the riding arena. Some persons with H, and D develope B which makes continued ridning extremely difficult. Riding becomes difficult for people with DB because they do not see their position in the arena nor can communicate with the instructor using sound. The only possible way is stopping the ride, and using tactile communication for information transfer and feedback.

Figure 1 shows the rider with DB and her assistant walking close to the horse prepared to inform to rider about the instructions given by the instructor.

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Figure 1: ***The assistant walking close to the rider with DB prepared to inform her about the instructions given by the instructor***

Figure 2 shows the rider with DB receiving tactile instructions in her hand(s) via a sign language interpreter.

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Figure 2: ***The rider with DB receiving tactile instructions in her hand(s) via a sign language interpreter.***

Even riders with severe HI and D may have problems riding because they have difficult hearing the instructor, and cannot see the instructor's signs in all angles.

There are approximately 3000 people with DB in Sweden under the age of 65. If counting people > 65 years, there are probably about 30-40,000 persons [11].

According to the organization Funka [12], in Sweden about 50% of people over 16 have visual problem, 120,000 with VI, of which 10,000 are with severe VI or B, 1.3 million are with HI, out of which about 15,000 are with D. There are 560,000 people over the age of 16 years who have a reduction in mobility, of which 130,000 people use a wheelchair. A significant number of persons with disabilities also imply cognitive disorders. A large number of these persons perform physical activity for rehabilitation purposes [10, 13-15] where they are dependent on an assistant. Having an assistant close to at all times, can reduce the person's participation and impair the privacy, thereby reducing quality of life. Many persons with severe VI, B, DB and/or cognitive disability find it difficult to start/continue physical activities such as riding which requires continuous information. For these persons simple information through the skin can be fast and efficient. They would benefit of a tactile aid, Ready-Ride (distance communications system) which can be used for communicating with instructor [16-22].

Ready-Ride is developed by researchers at

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Örebro University in collaboration with Audiological research center (Ahlséns research institute) at University Hospital at Örebro and a number of members of FSDB with DB starting 2003. The system has been developed based on results and feedback from laboratory tests and field tests performed by riders with DB.

The aim of the study is describing the tactile aid Ready-Ride technically in detail, how it can placed on the body and used when conducting leisure activities, and results of the field tests.

2. METHOD

2.1 READY-RIDE

Ready-Ride consists of a transmitter and a receiver unit communicating via Bluetooth (see Figure 3). The transmitter unit has four buttons. Each of them controlling a small vibrator connected to the receiver with wire.

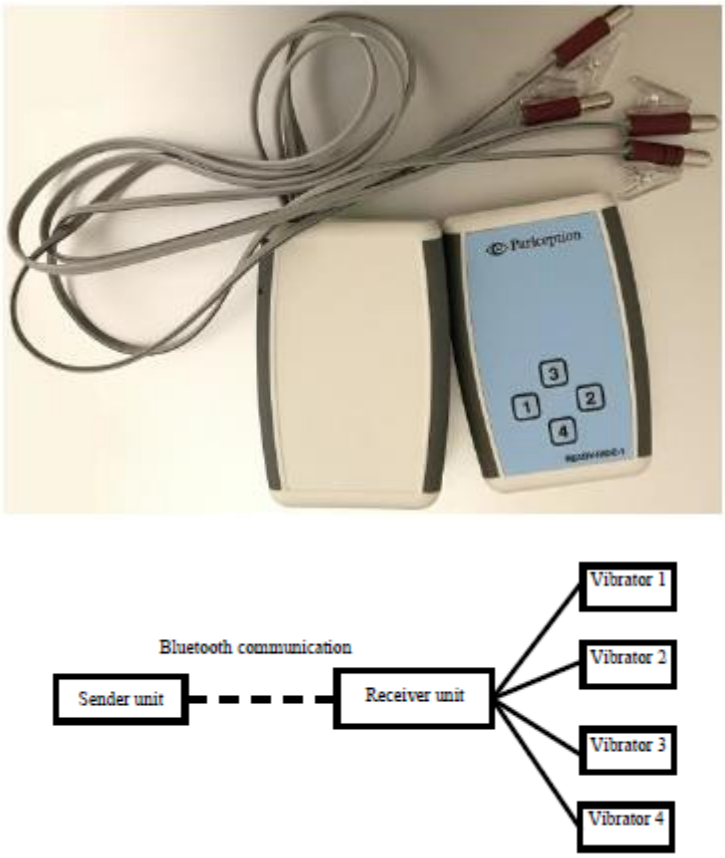

Figure 3: ***Ready-Ride: One transmitter with four buttons and a receiver with four vibrators. Upper, photo of Ready-Ride.***

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The transmitter unit: A handheld box with four buttons, an on/off button, two Light Emitting Diodes (LEDs), four momentary push-buttons and a port for Micro-USB to program the processor and charge the battery.

The receiver unit: A handheld box connected to four vibrators with about 60, 70, 80 or 90 cm long cords. It has an on/off switch and an LED for status indications and a port for Micro-USB.

Vibrators: There are four vibrators which are wire-connected to the receiver unit. The vibrators are attached by a chromium clamps.

Battery: Both the transmitter unit and receiver unit contains a built-in rechargeable lithium battery. A full charge- up require 1 h giving 2 h normal operation time.

Placing the vibrators and start-up

The instructor holds the transmitter in her/his hand while the user puts the receiver in a pocket or waist bag. The vibrators are placed in preferred positions on the body. The user and the instructor agree on vibrator positions and what each vibrator will announce. Common position to attach the vibrators are on the right or left side of the cheek with the clip on the helmet to signal the "Turn right", or "Turn left". A vibrator under the jaw will notify "Start,...". The fourth vibrator can be placed anywhere on the body to signal "Stop".

Using the system

All vibrators can be activated individually or simultaneously independently of each other and they vibrate as long as the corresponding button on the transmitter is pressed. It is recommended not using too complex combinations of the signals which can be confusing. The rider/user and the instructor must agree on the meaning of the signal patterns. When the user becomes more familiar with the aid, the degree of difficulty can be increased. For emergency stop activate all four vibrators with a long pulse.

2.2 RIDING ARENA

The typical riding arena sizes are: "Standard multi-purpose", "Driving arena" or "Competition Jumping Arena" [23]. The Standard Multi-Purpose is common in Sweden and has three different sizes: "20m x 40m", "20m x 60m", and "30m x 60m" where different parts are marked with a specific letter ("living letters") (see Figure 4). Different commands from the instructor requires that the rider has knowledge about how to move from one point (letter) to another, passing through what letter, with accuracy.

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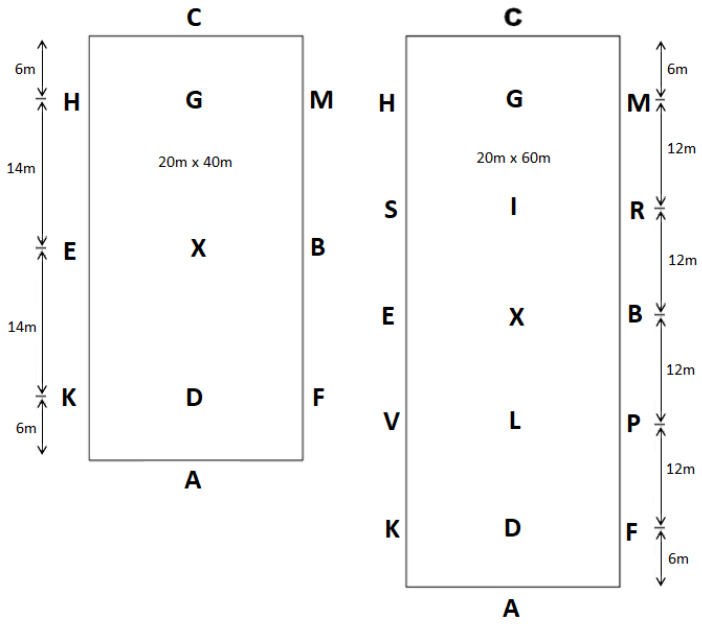

Figure 4: ***A 20m x 40m arena marked by 11 letters and a 20m x 60m arena marked with 17 letters.***

For example when the instructor gives the command, "Long diagonal" then the rider must ride from point “K” to M through “X”, and turn to left at left corner, passing the “C”, where turn and ride diagonally from “H” to the point “F through point “X”, turn right to ride to point “A”. The instructor continuously gives feedback and corrects the riding if necessary. Figure 5 shows the user with DB and her assistant guiding her from a distance using Ready- Ride.

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Figure 5: ***The user with deafblindness and her assistant guiding her from a distance using the Ready-Ride.***

2.3 SUBJECTS

Six females with DB, between 30-55 years of age and one male with B age 40 (with tunnel vision) tested Ready-Ride in laboratory and in field during about 10 riding lessons. One of the females with DB has experience longer than 3 years (>50 riding lessons), using Ready-Ride which will be described.

3. RESULTS AND DISCUSSION

Ready-Ride has been tested in a laboratory and in field with seven riders, six with DB and one with B. In general all subjects were positive and would continue to use it. They could easily use Ready-ride without requiring long introduction and guidance to get started. The vibrations are intuitive, easy to detect and to distinguish. Ready-Ride is mobile device that can work anywhere without any needs to adapt to the environment. The systems give the rider tactual information without disturbing other persons or horses nearby. Using Ready-Ride the riders got more time to ride since they can communicate while they continued riding. The quality of the riding lesson increased as they could get immediate feedback directly. The vibrators could fall if they were not attached properly. On the other hand they were connected via cables which held them together. One subject with B and tunnel vision would use Ready-Ride

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since he could not see the letters and the instructor did not need to shout. One with DB also used it when she was going to walk alone and she could be guided from a distance. One with DB could go for a walk with her three year old daughter while the assistant could guide her from the distance so they could keep their privacy.

Ready-Ride is a distance communication system and can be used by anyone who needs information/guidance from distance because they cannot use their vision, hearing, or when they need additional information. The potential users of the Ready-Ride are persons with severe HI/VI, D, B, and particularly DB. People with cognitive impairment (may have difficulty in interpreting information and speech) are also possible candidates as users. Those who have difficulty with body perception (may have difficulty with right and left, forwards and backwards), space perception (may be difficult to orientation, finding) or by those who have difficulty in orientating themselves. In addition to riding, Ready-Ride can also be used in other activities where you need to communicate from a distance or get extra clear information, for example, when walking, performing different sports, running, orientation, skiing, ... or by professionals such as smoke divers when they need guidance from distance because they cannot use their vision or hearing.

4. CONCLUSION

Ready-Ride is a simple system that can meet the needs of most riders. It is easy to use and requires no long introductions, installations or costs to start using it. The vibrations are easy to understand and intuitive to interpret. The advantage of the cables was that all parts are connected and the risk of losing a vibrator is low.

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