



Gibalica

Exercise
application

USER
GUIDE

August 2022

v1.0

INNOSID

Innovative Solutions based on Emerging Technologies for
Improving Social Inclusion of People with Disabilities

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1 About application

1.1 Introduction

This product is intended to be used as a virtual fitness trainer. It aims to encourage physical activities of all people. It has accessibility features so that the application can be used by people with various disabilities.

Target users are people who would like to:

- engage in basic physical activities,
- improve left-right orientation,
- have fun playing games like "Day-Night".

The main feature of the application is the recognition of the user and his position (e.g. the position of the head, arms, legs, torso...) using the live feed from the device's camera as input. The mobile device recognises the user from head to toe and uses this information to detect whether the user has performed the exercise correctly.

The application has three games: "Training", "Day-night" and "Dancing". Each of them uses 13 poses that are used in different contexts. Just some of them are: right hand up, left hand by the side, right leg up, etc.

"Training" is a game that practices poses in detail and step by step according to difficulty, "Day-night" is a game that uses only two poses (a quiet position (marker for "Day") and squatting (marker for "Night")), and a game "Dancing" that, in addition to the background melody, randomly changes poses in rhythm with the songs.



Figure 1: Graphical representation of the basic visual details of the application

1.2 Solution

Gibalica application is intended for all users who want to improve their physical activity and learn about exercise.

The trademark, i.e. the logo of the Gibalica application, is precisely Gibalica - a girl who guides the user through the exercise process and encourages him to perform the exercises correctly. The application icon can be seen in the Figure 2.



Figure 2: Application logo

The Gibalica application greets the user upon first access and welcomes him/her with the following welcome screen, shown in Figure 3. The user further familiarizes himself/herself with the functionality of the application by selecting the right arrow.



Figure 3: Welcome screen

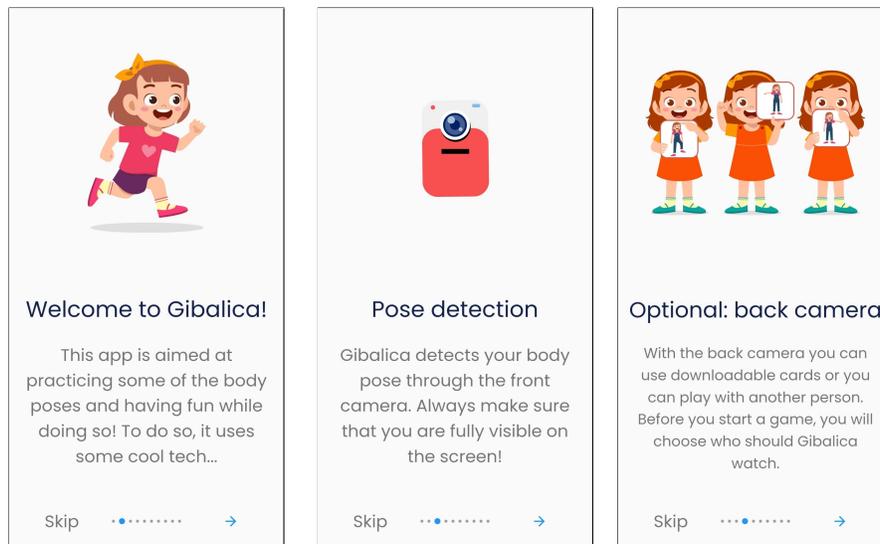
1.3 Get to know the Gibalica application

When the user accesses the application for the first time, he/she gets to know all the functionalities and possibilities of the developed solution in 8 short, vivid illustrations (Figures 4, 5, 6, 7a). The user can move forward and backward the screens (illustrations) by clicking on the right arrow or/and by swiping right and left.

The first image of the screen shown in Figure 4a informs the user about the purpose of the Gibalica application, more specifically that it is used for practicing and learning.

Gibalica applications use artificial intelligence, i.e., computer vision, to recognise the user's body movements and based on the detected, conclude whether the given exercise was successfully. Figure 4b shows that the user can perform the exercise by recording the body movements with the front camera.

The desired exercises, in addition to the real body, can be represented with cards. In this case, the exercise is recorded by the back camera (Image 4c).



(a) The main purpose of the application

(b) Body movement recording method

(c) Exercise with cards

Figure 4: Information about the Gibalica application

The developed solution provides 3 games (Figure 5) that the user can play to practice and learn about physical activity.

The first game is the "Training" game (Figure 6a), in which the user must repeat the exercises provided by Gibalica. By performing these exercises, the user trains his arms and legs.

The following game, "Day-Night" (Figure 6b), represents a digital version of the game of the same name for children. The exercise leader instructs the user whether to take the "day" (standing upright) or "night" (squatting) position. Depending on the instruction, the user assumes the position as quickly as possible. The user is expected to react quickly, which is why this trains the user's concentration.

The last game is the "Dancing" game (Figure 6c), where the user has to repeat the exercises given by Gibalica to the rhythm of the melody. The mentioned exercise is performed with background music, which makes the exercise itself more interesting and turns it into dancing.

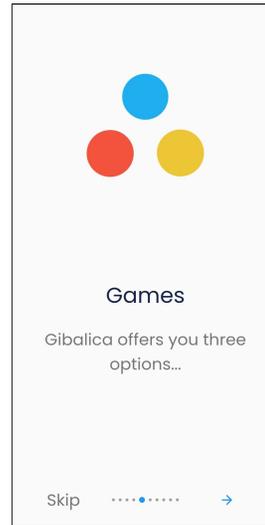


Figure 5: Dostupnost triju igara

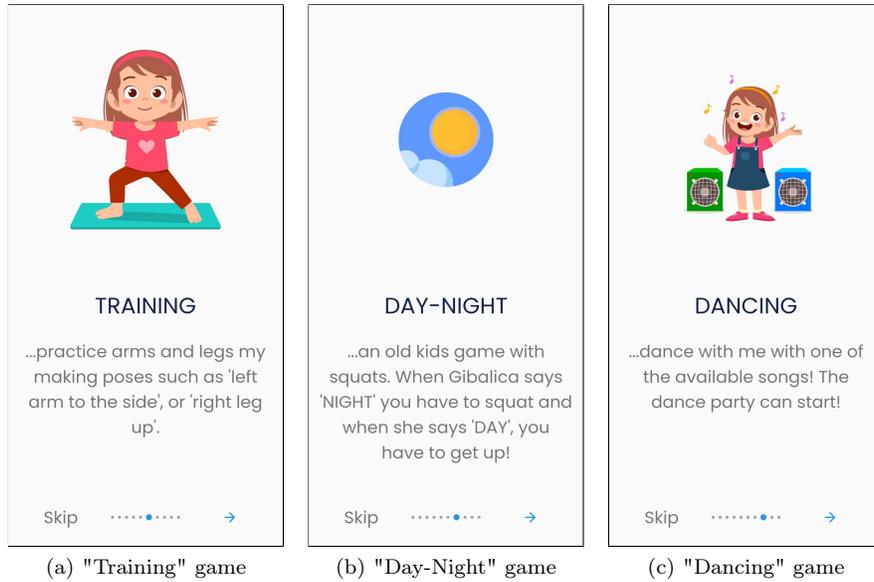
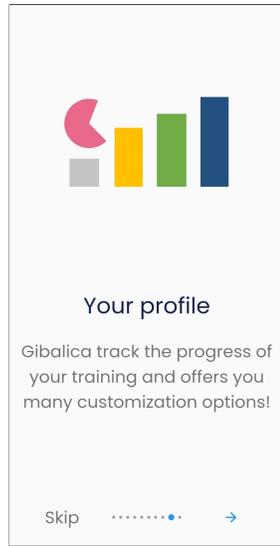


Figure 6: Information about the Gibalica application

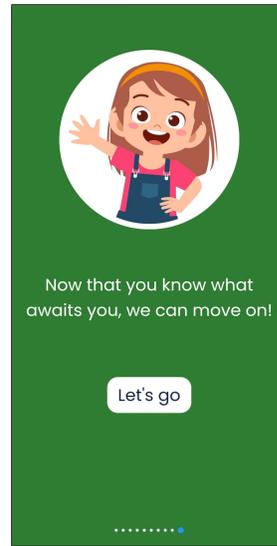
The last illustrative display, i.e. the information transmitted to the user, is the user's profile. During the game, the Gibalica application monitors the user's progress and the user can view his/her training statistics at any time (Figure 7a).

Moreover, throughout getting to know the Gibalica application, the user can select the "Skip" option in the lower left corner and skip all the instructions and move on to the next part of the application.

The screen in Figure 7b) shows the last figure, where Gibalica greets the user and wants to get to know him better. The "next" button takes the user to the next part of the application.



(a) Statistical data



(b) Welcome screen "Let's go"

Figure 7: Information about Gibalica

1.4 User information collection

Applications Gibalica wants to collect basic information from the user to know him/her better. The information that the user shares with the Gibalica application may be changed later. Any information shared will be used exclusively within the application and will not be shared with third parties.

Gibalica first asks the user for his name (Figure 8a). By selecting the blue box, the user opens the keyboard and must enter his/her name (Figure 8b). After completing the entry (Figure 8c), the user can go to the next entry by selecting the "Next" option or swiping to the right. The Gibalica application does not allow the user to go to the next step until the name is entered.

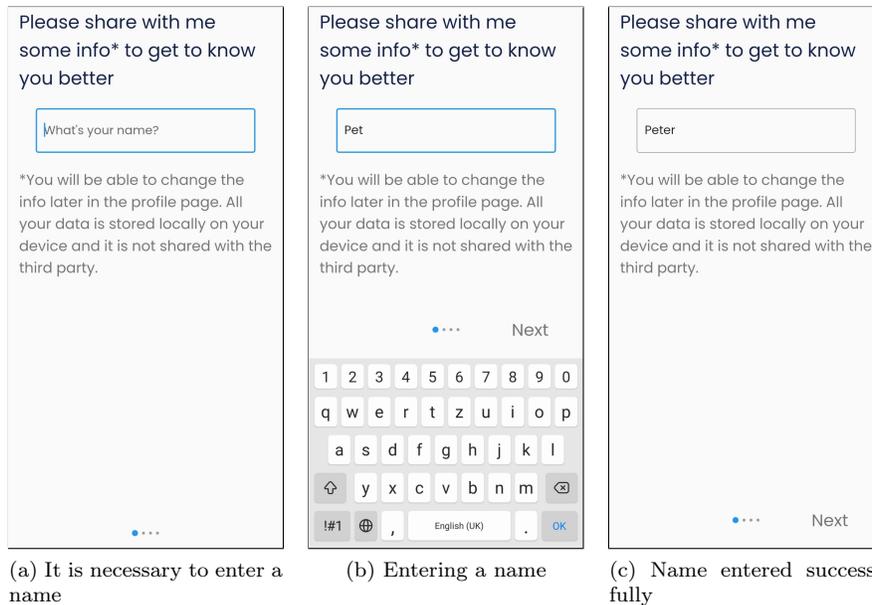


Figure 8: Name entry

Then the user must select an avatar that will represent him/her during the game. Figure 9a shows the start screen with a predefined selection of avatars (circled in green). The user selects another avatar by touching it, and the background behind the selected avatar is circled in green. The Figure 9b shows the appearance when the desired avatar is selected (the second avatar in the second row).

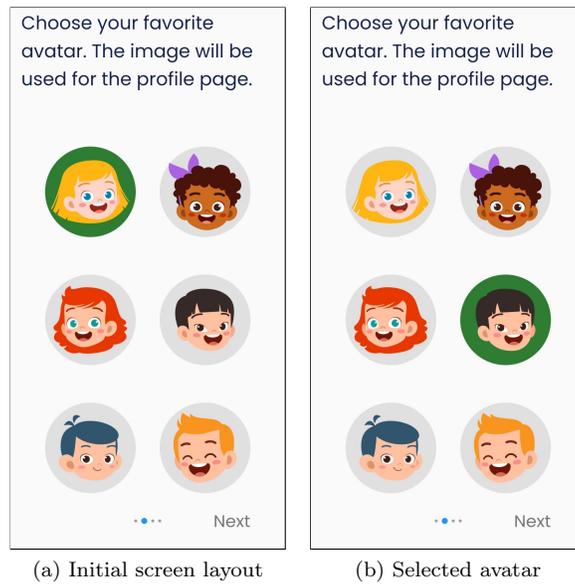


Figure 9: Choosing an avatar

The next step in getting to know the user is to customize the training program. As a predefined option, the program is without restrictions for body parts (the user prefers to use both arms and legs), which is indicated by the power button, and all body parts are marked and disabled for selection, i.e. changes are not possible (Figure 10a).

Each user can customise the program to their needs. When the drop button is turned off, the offered body parts are no longer disabled and the user can customise their exercise (Figure 10b).



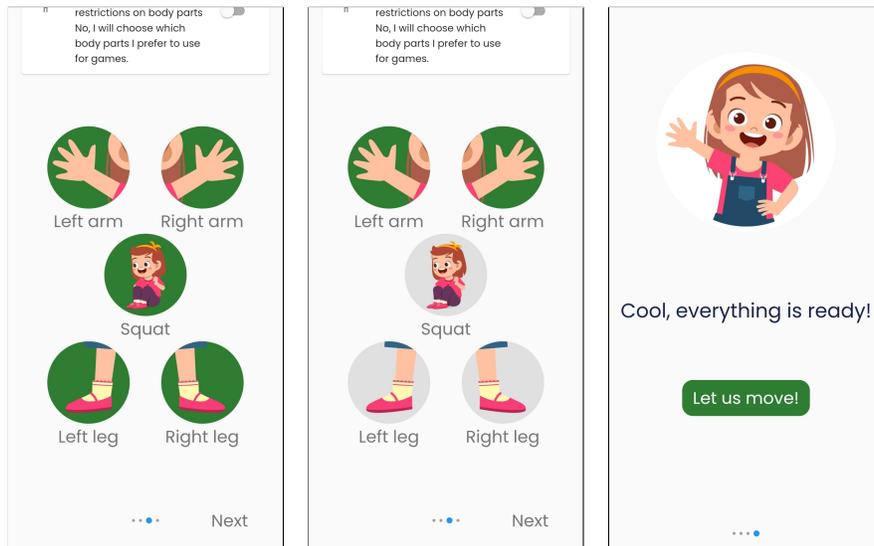
Figure 10: Program selection

Customisation of training consists of following options that the user can choose:

- left arm,
- right arm,
- squat,
- left leg and
- right leg.

Initially, all exercises are marked as trainable, which is visually visible as they are circled in green (Figure 11a). The user can unmark an individual exercise by touching it. If the exercise is not marked, the background remains rounded, but the colour changes from green to grey (Figure 11b).

After selecting the "Next" option and successfully saving all the information about the user, the Gibalica application informs the user that everything has been successfully set and that it is time to move (Figure 11c).



(a) The initial layout of the exercises screen

(b) Selecting only certain exercises

(c) Welcome screen "Move!"

Figure 11: Selecting a custom program

1.5 Main menu

After seeing all the features of the application and entering information about the user, he/she will be redirected to the main screen of the application (Figure 12).

In the central part of the screen there are options with three main games:

- "Training" game,
- "Day-Night" game and
- "Dancing" game.

Selecting a game opens a new window where the user starts the game. Each individual game is explained in more detail below.

Besides the central menu on the main screen, there are additional buttons that allow access to the user's profile (icon of the selected avatar in the upper left corner) and settings (gear icon in the upper right corner).

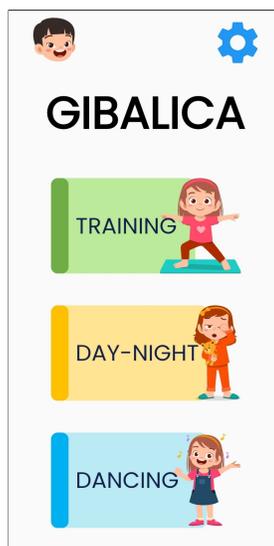


Figure 12: Main screen

1.6 Games

The main purpose of all three games is to encourage the user to exercise or to learn something about exercise. Each game has its own peculiarities and interesting features, which are described below.



Figure 13: Options to choose whether the camera looks at: "me" or "cards"

The operating principle of all games is to record the user's movements with the camera. With the help of computer vision, the Gibalica application interprets the captured images and creates a context, that is, it recognises the position of the body. As mentioned earlier, each game can be played in two ways, in the sense that Gibalica watches the user ("me") or the "cards" (or another person).

When the "me" option is selected, the front camera is used when the user is playing. If the "card" option is selected, the application uses the rear camera of the device. The 13 image shows the appearance of the icons for the options Gibalica uses to look at "me" (a standing girl figure)

and the display of the icon when Gibalica takes "cards" (a card icon with Gibalica's figure). The following question is asked to the user when entering each exercise.

In addition, before each exercise, the user is informed and warned about important information so that the exercise is successful. The warning indicates that if the user cannot exercise for any reason (health, lack of space, inability to position the device), he should stop the application and continue the exercise at another time (Figure 14a). This warning is displayed each time you enter a specific exercise. The user can turn off the display.

The warning is followed, depending on the user's choice, by a screen explaining in more detail the correct way to play. If the user has chosen the "me" option, the front camera will be turned on. In this case, the user must fix the device in a position that ensures that the user's body is visible on the screen and there is enough space around him to move (Figure 14b). When Gibalica is selected to display "cards" the rear camera turns on. The user must then point the device at the card (or another person) so that the whole body is visible on the screen.

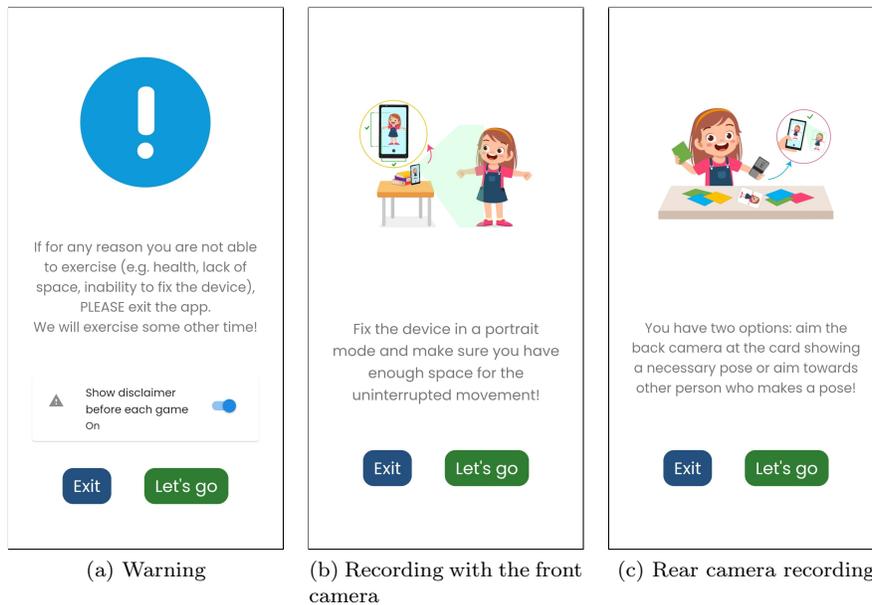


Figure 14: Illustrative instructions for the correct use of the application

In order to give the user enough time to take a suitable position so that he can see his whole body at the beginning of each game, there is a countdown (from the number 3 to 1). This is followed by a preparation phase in which the user must adopt a neutral pose (arms next to the body and legs straight). The view of the neutral pose given by Gibalica is shown in Figure 15a. In this

way, the application detects the user's hands and feet and recognises the user within the camera frame. The correct positioning ensures that the position of the user's body is read correctly and ultimately all functions of the application work properly.

The onboarding process works in such a way that the Gibalica application assumes a neutral pose (Figure 15a). Then it detects whether the user has taken the given position (Figure 15b). If the position is taken, the background around the icon indicating the position will be filled quietly in a circle. When the position is taken correctly and the circle is filled in, the preparation is complete, see Figure 15c. If the user has not taken the correct position, the preparation is repeated.

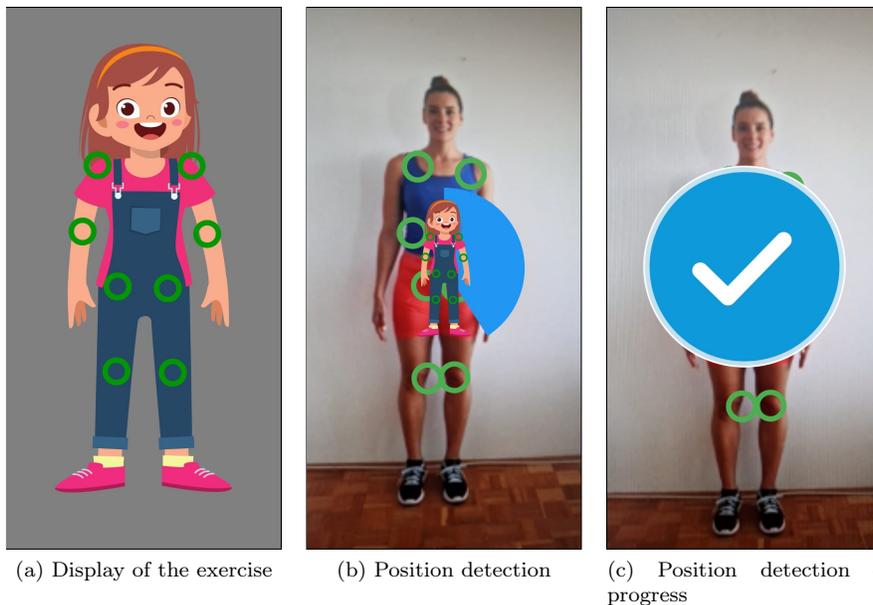


Figure 15: Onboarding process

1.6.1 "Training" game

Training is a game in which the user performs various workouts consisting of several exercises. In the training list, the user is offered the exercises that he has marked as trainable while collecting information about the user. User can move through the "Training" game screen by scrolling down or up, as shown in Figure 24.

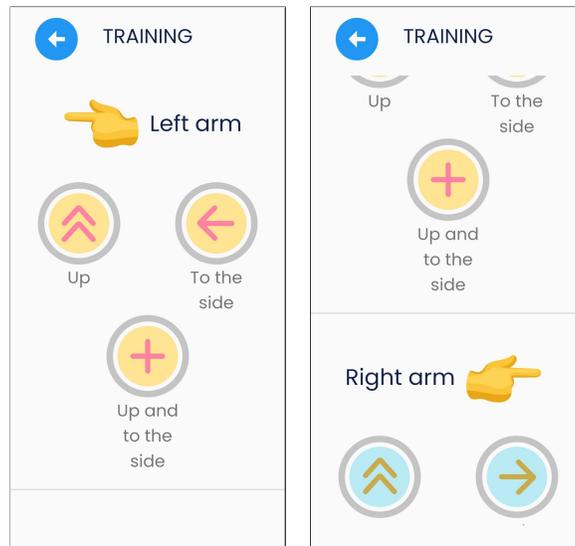
The workouts available in the "Training" game are grouped according to the limbs and the complexity of the exercises themselves. The following workouts are available in order:

- training for the left arm,

- training for the right arm,
- training for left and right arm,
- training for your legs
- training for arms and legs.

Each workout has a set of exercises that go with it. For the left arm workout (Figure 16a) and for the right arm workout (Figure 17a), there are exercise options to lift the arm up, to the side, and a combination of options up and to the side. For left and right arm training (17b, 17c) there is a similar set of exercises to lift both hands up and to the side and then a combination of hands up and to the side (same and different position) and finally a combination of all previously mentioned exercises within the training for training both arms.

After a group of training sessions only for the arms, there are also training sessions that involve the legs. In the leg workout (Figure 17c), there is an exercise where user lift his/her left leg in the air and lift his/her right leg in the air. In the workout for both legs (Figure 18a), there are exercises for lifting the left or right leg in the air, lunging, and squatting. Finally, there is a workout for both arms and legs that contains only one exercise called "All". Within this exercise, the user can get any of the previously mentioned exercises.



(a) Initial screen layout (left hand exercises)

(b) Scrolling down

Figure 16: Moving through the game "Training"

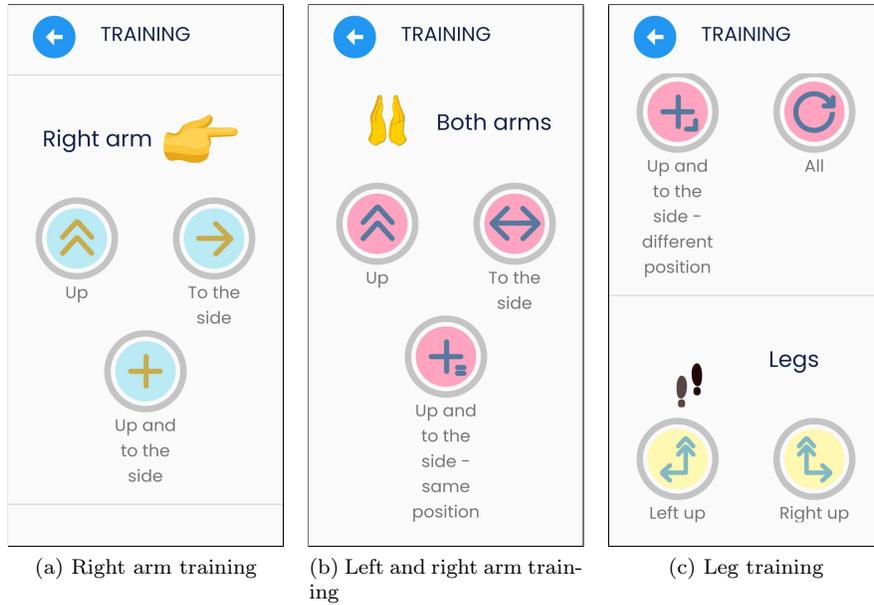


Figure 17: "Training" game

Each exercise is started by selecting the circular icon. For example, in the arm and leg workout, if user selecta the "All" exercise represented by the infinity icon (Figure 18b below), a new screen will open as shown in Figure 18c. In that screen, seen from the top, there is first the name of the exercise (in this case, the exercise "All"), the number of repetitions of the exercise (1, 2, 3, 5 or 10 times) and the choice of whom Gibalica considers "me" or "cards " (in this case, "cards"). Then the switch button, which allows user to set the repetition of the pose until right answer. At the end there is a "Play" button that starts the exercise.

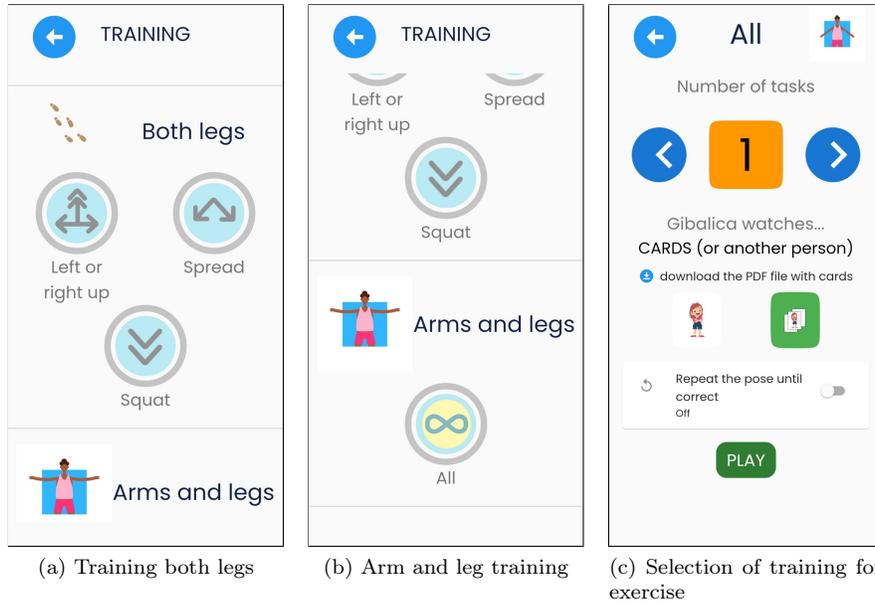


Figure 18: "Training" game

The principle of performing a single exercise consists of the preparation described earlier and shown in Figure 15. After the user has successfully assumed a neutral pose, he/she is shown the next exercise in the sequence that he/she must perform. Between each exercise, the user is asked to assume a neutral pose.

If the exercise is not performed correctly, this will be indicated to the user with a red circular mark, as in Figure 19a. If the option to repeat the pose until it is performed correctly is enabled (Figure 18c), the repeat marker is then displayed (Figure 19b). A correctly performed exercise is indicated with a blue circular mark, as in Figure 15c. Success, i.e., failure in performing a single exercise, is visually indicated with a progress bar at the top of the screen. Within the bar is the percentage of exercises performed. If the exercise is performed incorrectly, the percentage decreases; if it is performed correctly, the percentage increases.

After completion and successful execution of all exercises belonging to the respective training, the user receives a positive feedback about the completion (Figure 20a). This is followed by the screen shown in Figure 20b, which lists the percentage of the completed exercise. The user can exit the exercise and return to other workouts or perform the same exercise again.

The user can select the "Back" option at any time and return to the training screen. Successful training is indicated graphically by a change in the color of the marker, which is no longer light but darker (Figure 20c).

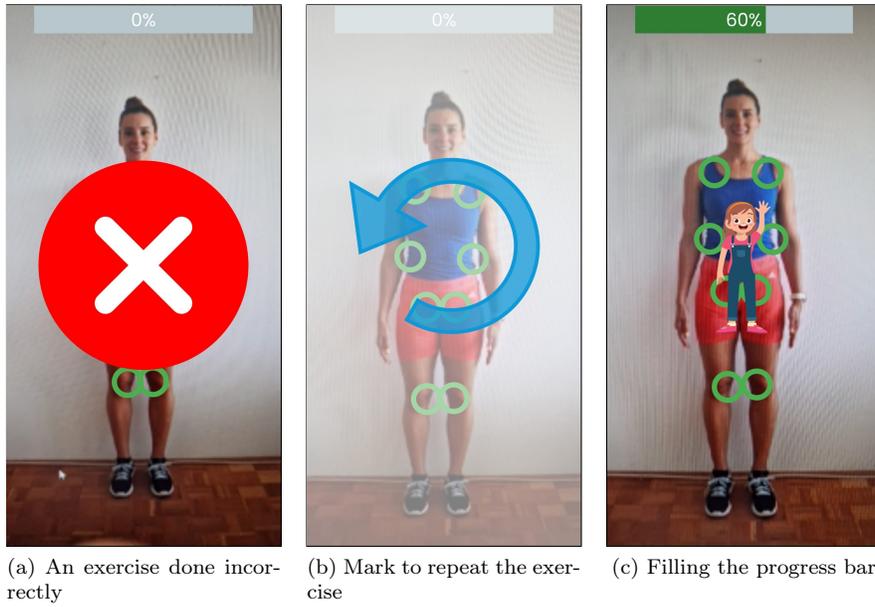


Figure 19: "Training" game

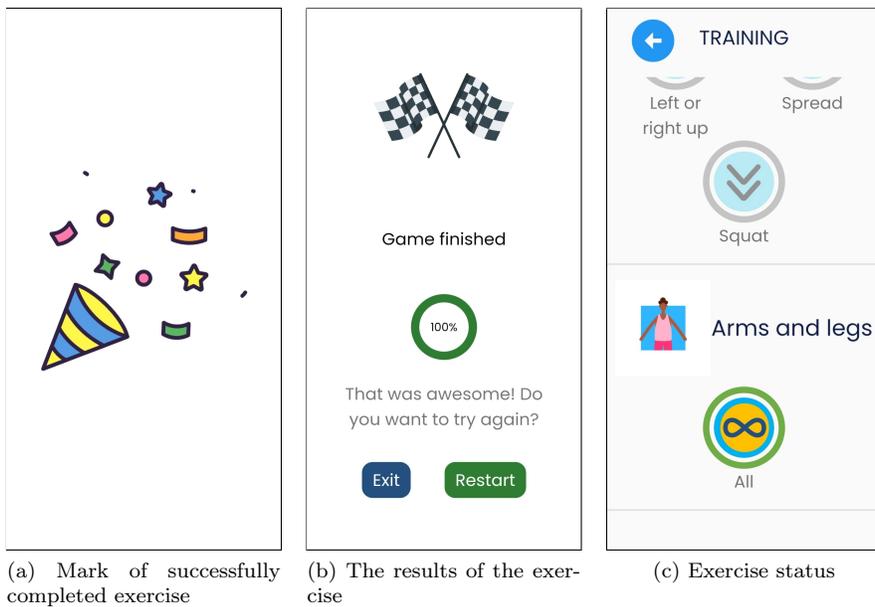


Figure 20: "Training" game

1.6.2 "Day-Night" game

The "Day-Night" game in the application is a digital version of the game of the same name for children. In reality, the game is played in such a way that one person gives the commands "day" or "night" and the other people have to take the position symbolising these commands as quickly as possible. For the command "day" one must stand still (i.e. neutral pose), and for the command "night" one must squat. If a player takes the wrong position, he is eliminated from the game and the winner is the player who stays in the game the longest.

In the Gibalica application, the person giving the commands is the Gibalica, which displays the appropriate images for each command. Figure 21a shows the "day" command, while Figure 21b shows the "night" command.

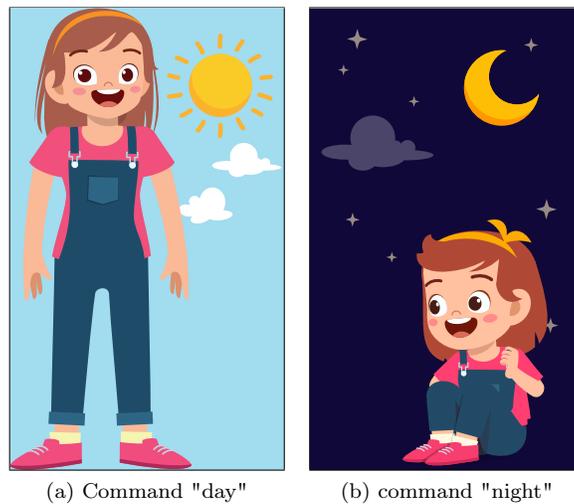


Figure 21: "Day-Night" game

When selecting the "Day-Night" game, the screen shown in Figure 22 opens to the user.

The user first selects how many command changes or repetitions they want (3, 5, 10, 15, 20, 30, 40, or 50). The default value is 5 commands. Then the user must choose how he/she wants to do the exercise, whether Gibalica looks at "me" or "cards", and whether to repeat the exercise until it is correct. After the selection, the user starts the game with the "Play" button.

The user is first asked to assume an "neutral pose," which he or she must hold for three seconds. After that, the user is presented with a randomly chosen "day" or "night" command, which he must hold for the next three seconds. After successfully taking a pose, the process already continues with a new randomly selected pose. The incorrectness, i.e. the correctness of the execution of a single exercise is performed and displayed in the same way as in the "Training" game (Figure 19a, 19b and 19c).

It is worth noting that in order to optimise the user experience ¹ a more advanced algorithm will be developed that will also take into account the position of the legs in the "squat" pose in future versions of the application.

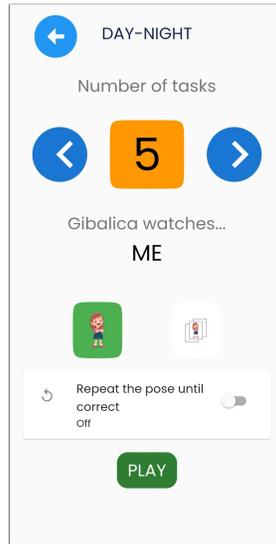


Figure 22: "Day-Night" game

¹The application assumes that the user has adopted a "squat" pose when the user's head is in the lower half of the screen

1.6.3 "Dancing" game

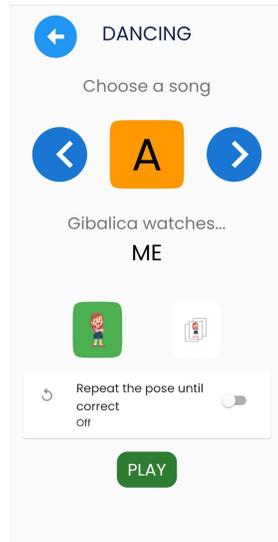


Figure 23: "Dancing" game

Night" games. This is shown in 19a, 19b and 19c.

In addition, after successful completion of the exercise, a marker for successful completion of the dance is displayed (Figure 20a) and the results of the executed dance are displayed (Figure 20b).

The game "Dancing" is the next game in the Gibalica application, where the user exercises and dances at the same time. When you start the game, the screen shown in Figure 23 is displayed.

Before dancing, the user must select a song (A, B, C, D or E) that will serve as a background melody while dancing. Then, as in other games, he/she must choose whether he/she wants Gibalica to look at "me" or "the cards". It is also possible to repeat the pose until it is correct.

The "Dancing" game has the same exercise sequence as the "Training" and "Day-

1.7 Profile

The user profile displays the stored information about the user. The screen can be accessed from the main screen by selecting the avatar icon in the upper left corner (Figure 12).

The main information that can be found on the profile (Figure 24a) is the selected avatar and the entered name. Also, the user can view the exercise data, which is shown in the Figures 24a and 24b. If the user has marked in the list of exercises that he/she does not want to train a part of the body within the profile, this will be visible by a lighter display (Figure 24b). When the user successfully completes an exercise within the "Training" game, this is saved and is graphically visible by filling in the progress bar and circle (Figure 24c). Data on training of upper body (training for left hand, right hand and left and right hand), lower body (training for legs and training for both legs and squat) and total exercises are monitored.

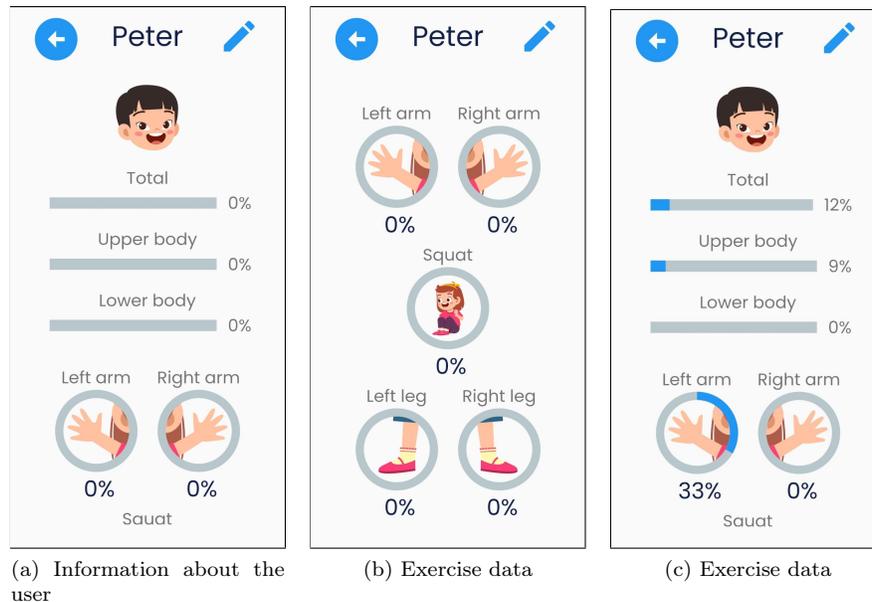


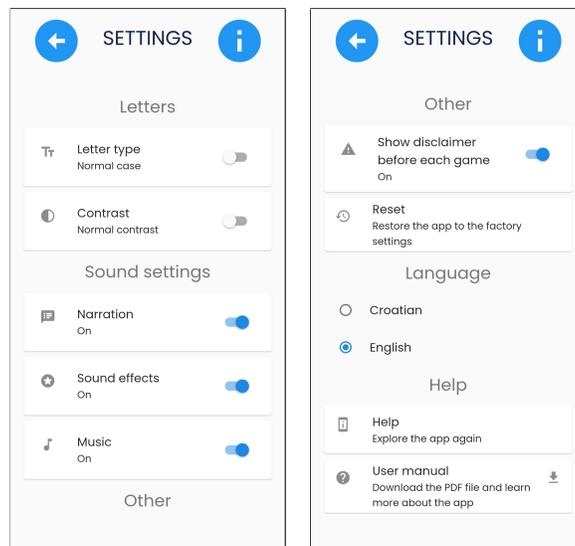
Figure 24: User profile

1.8 Settings

The application settings are shown in Figures 25a and 25b. In the settings user can find the following:

- Font customization:
 - change of font type,

- change font contrast.
- sound adjustment:
 - Gibalica’s speech,
 - sound effects,
 - music.
- Other:
 - warning display,
 - return to factory settings.
- Language:
 - Croatian,
 - English.
- Help:
 - reacquainting yourself with the application (Chapter 1.3),
 - user manual.



(a) The initial part of the screen (b) The rest of the screen

Figure 25: Settings

All screen customisation options and how the selected options affect the appearance of the Gibalica application are described in more detail below.

The option to change the font type allows you to choose between lowercase and uppercase or uppercase only. The change to uppercase is shown in Figure 26a.

By changing the contrast, the text within the application changes and takes on a high contrast. More precisely, the background of the text is yellow, and the text itself is black. An example is visible in Figure 26b.

Within the application we distinguish three sounds: Gibalica's speech, sound effects and music. The Gibalica's speech represents the speech of the main character of the application, who tells the user certain guidelines for training and encourages him. Sound effects are accompanying sound signals when the exercise is performed (in)correctly. Music is a soundtrack that appears at various points. All three sounds mentioned can be turned on and off.

All the settings listed are not mutually exclusive. This would mean that all options listed in the customization can be changed at the same time.

In addition, the user can disable the display of warnings before each game and reset applications and reset everything to factory settings.

The final customization option is to change the language. When the Gibalica application is launched for the first time, the application language is set to the language primarily used on the device where the application is installed. The option to change the language provides support for Croatian and English. Figure 26c shows the appearance of the screen when the Croatian language is selected.

The user can go through all the functions again at any time by selecting the reacquaint option, and he/she can download the user manual in PDF format.

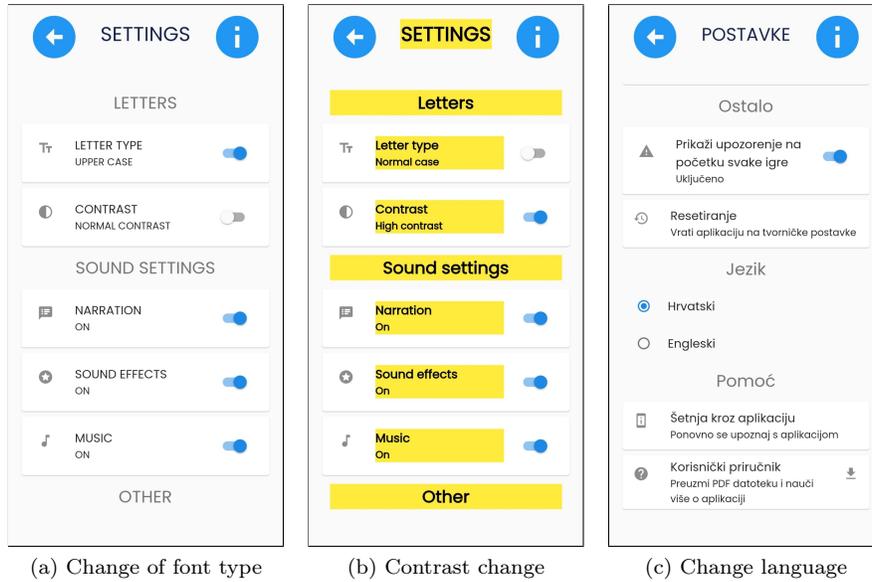


Figure 26: Example of changing settings

2 Frequently asked questions

Below are questions that describe the details of the application in more detail than the explanations in the previous chapters.

2.1 How can I restart the onboarding to the application?

Restarting the onboarding process is located in the settings screen, more precisely at the bottom. To do this, click on the Help - Exploring the app again. Visible in Figure 25b.

2.2 How to change user details?

After the first successful saving of user information, it is possible to change the saved information. To do this, on the user profile screen, select the button with the pencil icon in the upper right corner of the screen (visible in the Figure 24a). When you select the specified button, the sequence of activities described in more detail in Chapter 1.4 is repeated.

2.3 What is the correct position if I do the exercise alone (with the front camera)?

The user is correctly positioned in front of the camera when he sees the entire legs (stretched position) and the entire arms (spread position) on the screen. As Figure 27a shows, the arms and legs are inside the screen. Figure 27b shows incorrect positioning within the screen, as part of the user's left hand and the tip of the left foot are outside the frame.

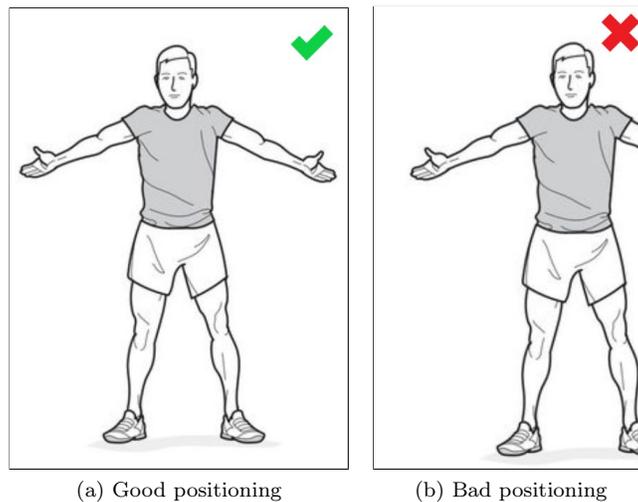


Figure 27: Positioning example

2.4 The Gibalica application doesn't detect me well enough?

First, check the answer to the previous question 2.3. If the recognition of your body does not work well enough even after correct positioning, check if the problem is in the background and/or in the clothes the user is wearing. It is recommended that the background behind the user is uniform, e.g. a white wall. If you are not able to provide such a background, wear clothes that do not resemble the background but stand out clearly from it. An additional problem can be the colour of your furniture, which is similar to your body colour.

It is important to emphasize that for the correct reading of the body position it is necessary to clearly separate the user from the background, i.e. the contrast between the body and the background must be good enough.

2.5 How can I send cards?

User can send cards or save them to the device by going to the appropriate screen at the beginning of the game. If you select the "cards" option on Gibalica, you

will be offered the option to download cards. This way you can download a PDF document with cards and send it to another device or printer.

2.6 Can I take photos of myself and print them out to use as cards?

In addition to the predefined maps, the user can take photos of himself and use these images as cards. Also, in addition to their own cards, the user can record another person performing exercises in real time.

3 Additional information

- Development lead: Jurica Babić
- Graphic design: Ivana Gače
- Narration: Giorgina
- Sounds, music: assets from Pixabay
- Animations: assets from LottieFiles - Lottie Simple License (FL 9.13.21)
- Cards photos: Margareta Teskera and Mateo Ćorluka
- Beta prototype development: Niko Rudelić
- Alfa prototype development : INNOSID hackathon 2022 Valencia students (Anita Karalyos, Ivan Sentić, Patricia Valcarcel Manzano, Ana Leventić, Daniel Varkoly, Krešimir Barbarić, Diego Gimenez Asensi, Jelena Nemčić)
- Early prototype development: Tomislav Fičko

The Gibalica application was developed within the Erasmus+ project entitled Innovative Solutions for Improving Social Inclusion of People with Disabilities (hereinafter: INNOSID; project reference: 2019-1-HR01-KA203-060959, <http://sociallab.fer.hr/innosid>). The INNOSID consortium is comprised of the following institutions:

- University of Zagreb Faculty of Electrical Engineering and Computing
- Universitat Politècnica de València
- University of Debrecen
- IMT Atlantique Bretagne Pays de la Loire
- University of Dubrovnik
- Instituto Politecnico de Santarem
- Croatian Down Syndrome Association.

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