

INSTRUCTIONS FOR USE



EN

Youth-GEMs Application



Model: Youth-GEMs App v3.8.0
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1. Introduction

These Instructions for Use support the safe and efficient use of the Youth-GEMs application for the collection of passive and active data to investigate mental health in adolescents and young people. These instructions are intended to support a correct installation and use of the application.

All efforts have been made to ensure the latest and most accurate information to be included in these Instructions for Use. As part of the product's life cycle, these instructions will be updated without further notice by the manufacturer. Please be sure to always work with the latest version of the document.

These instructions are available electronically via a dedicated website (<https://youthgemsrepo.ab-acus.com>). Print versions are available upon request. Simply contact us by writing an e-mail to ygsupport@ab-acus.eu.

Read the entire information manual for use before any use of the device. Periodically review the operating procedures and safety measures.

The Youth-GEMs application has been designed and manufactured only for the intended use described in this manual (chapter 3 - *Intended use*). Any other usage is not allowed.

The most relevant warnings and precautions are also listed individually in Chapter 2 - *Safety Information: Warnings and Precautions*.

1.1. Standards




The Youth-GEMs has been developed and tested according to the following regulations and standards:

- Regulation (EU) 2017/745 on medical devices (MDR)
- IEC 62366 -1, Medical devices - Part 1: Application of usability engineering to medical devices.
- IEC/TR 62366-2: Medical devices — Part 2: Guidance on the application of usability engineering to medical devices.
- IEC 62304, Medical device software — Software life cycle processes.
- ISO 13485, Medical devices - Quality management systems - Requirements for regulatory purposes.
- ISO 14971, Medical devices - Application of risk management to medical devices.
- ISO 24971, Medical devices - Guidance on the application of ISO 14971.
- ISO 82304:2, Health and wellness apps

1.1. Symbols

These instructions, as well as the product Youth-GEMs, use symbols according to the following standards:

- ISO 15223-1:2021: Medical devices - Symbols to be used with medical device labels, labelling and information to be supplied - Part 1: General requirements
- Regulation (EU) 2017/745 on medical devices (MDR)

Symbol	Meaning
	Consult the instructions for use
	Warning
	Manufacturer

1.2. Terminology definition

1.2.1. Error messages

WARNING: designates a possible imminent risk. If it is not avoided, it could lead to death or serious injuries.

CAUTION: designates a possible imminent risk. If this is not avoided, it could lead to minor injuries.

NOTICE: designates a possibly harmful situation. If this is not avoided, the product could be damaged.

1.3. Incident reporting

An **incident** means any malfunction or deterioration in the characteristics or performance of the system, including use errors due to ergonomic features as well as any inadequacy in the information supplied by the manufacturer and any undesirable side effects.

It is our responsibility to assure safe and efficient products on the market. If the user feels that any malfunction of our system can be classified as an **incident** as described above, they should contact us immediately at ygsupport@ab-acus.eu.

2. Safety Information: Warnings and Precautions



NOTICE: read all safety instructions before installing and operating the Youth-GEMs application.



NOTICE: the application requires remote data transfer. The transfer occurs using a Wi-Fi connection where available, or the mobile data usage associated with the smartphone on which the application is installed and running.



NOTICE: application access credentials are uniquely assigned and must not be shared with anyone.



NOTICE: when the user consents, the application uses the sensors of the smartphone to gather information about the lifestyle. Such data is transferred remotely for analysis.



NOTICE: when the user consents, the application uses the smartphone's microphone for collecting data on voice acoustic characteristics. Microphone activation is signalled to the user, and the data is transferred remotely for analysis.



NOTICE: The application requires no less than 70 MB of memory on your phone to install.

3. Intended use

The Youth-GEMs App is a mobile phone application meant to investigate youth (12-24 years) mental wellbeing by collecting digital data from various sources. The collected data are made available to the research centers enrolling them. The app has been developed within the Horizon Europe project Youth-GEMs (<https://youth-gems.eu/>), GA 101057182.

The Youth-GEMs App contains a mental health questionnaire and two activities to be spontaneously executed: 1) the typing of a short text to answer a general question or reflection which changes every day. From this activity we analyse the typing modalities, which we found from scientific evidence to be related to mental status. 2) the recording of user's voice while answering a simple general question (i.e. What colour are you feeling today?). The recorded data are elaborated by looking at the acoustic and semantic features of the speech.

The app is also capable of passive data collection from the sensors embedded in the smartphone, upon user consent. Within the clinical trial of the Youth-GEMs project, the app is meant to be used for 24 months by each user.

3.1. Contraindications

The system should not be used:

- For uses other than those indicated in the *Intended use* chapter
- As a medical device

3.2. Operating environment

To use the Youth-GEMs application, it is necessary to meet the following prerequisites:

- Own a smartphone with Android operating system version 10.0+, or iOS version 14+.
- Have access to a stable internet connection (Wi-Fi or mobile data) on the device where the Youth-GEMs application is installed.
- Have been assigned the credentials (username and password) from your reference research centre.

4. Product description

4.1. System overview

The Youth-GEMs application has the main purpose of collecting data about lifestyle and habits from the young participants to the Youth-GEMs clinical study in a “passive” way, i.e., acquiring data in the background.

Moreover, it proposes some voluntary activity of audio and text production, together with a clinical questionnaire, that can be “actively” performed by the user.

4.2. System components

4.2.1 Smartphone Application

See in Figure 1 the overall information architecture of the Youth-GEMs mobile application.

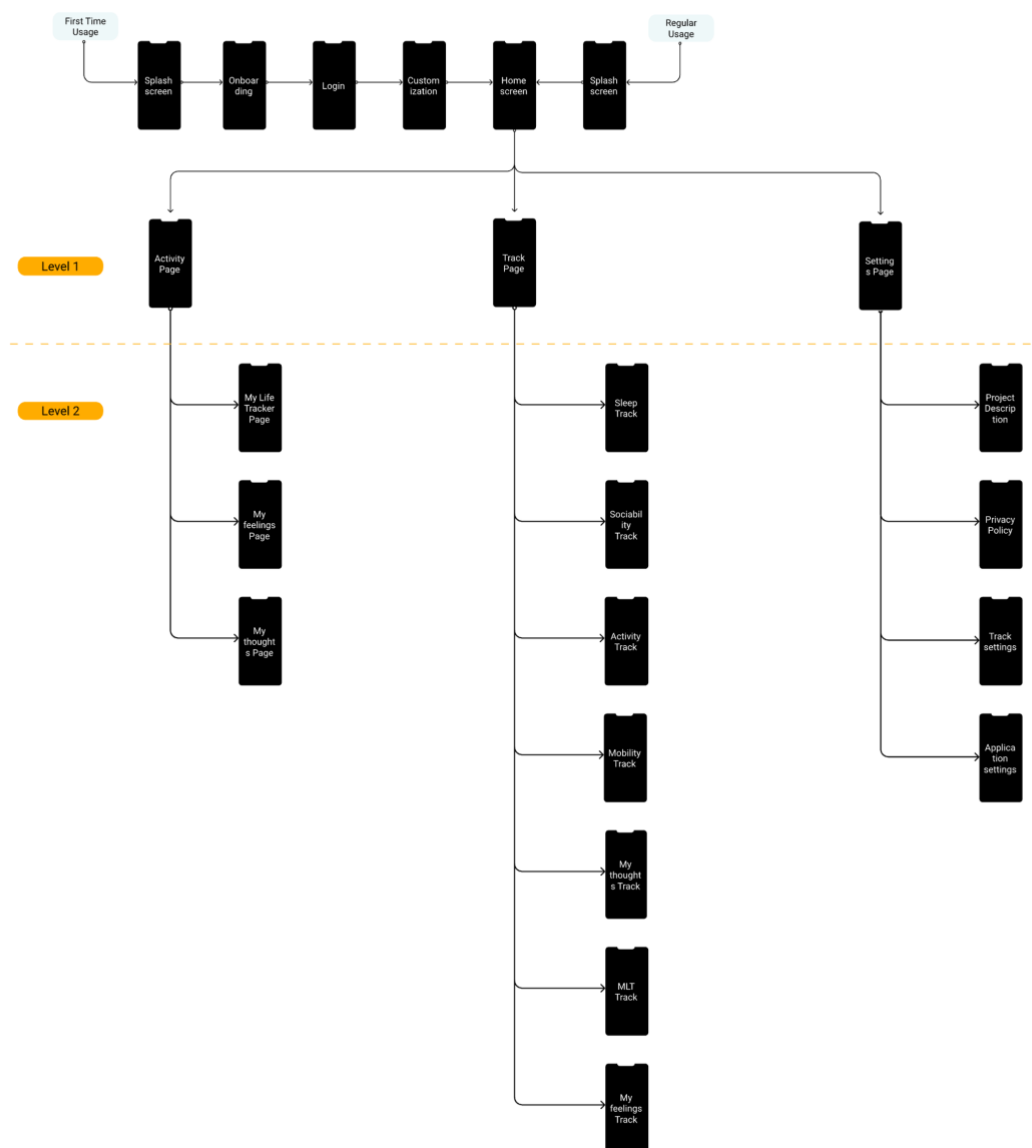


Figure 1: Youth-GEMs app information architecture

According to the proposed information architecture, the Youth-GEMs mobile app includes different functionalities hierarchically organised.

Starting from the top part of the figure there is an onboarding functionality, aimed at presenting the project and the main parts of the app that is administered just one time at the first access to the app.

Before starting, the user is also explained about the passive data collection features and is requested to provide the related permissions to access sensorial data. Permissions may be modified later at any time through the settings page.

The log in screen is also part of this introductory functionality, being the user requested to read and agree the privacy policy before any further action. Credentials may also be saved to speed up the login in the next visits.

Once entered in the core of the app, the passive background data acquisition is started.

Looking at the user interaction with the app, the functionalities can be divided in three main parts: activities performing, data tracking and settings.

The proposed activities involve the compilation of a mental health questionnaire (My Life Tracker), the recording of an audio file while answering a simple question (i.e., What colour are you feeling today?) and the keyboard typing for answering simple ice-breaking questions. All these actions are performed on a voluntary basis.

Looking at the tracking, the user is allowed to track both the passive and active data. The passive data may be checked on a daily or weekly basis and consist of mobility features (computed from GPS data), physical activity (computed from accelerometer and pedometer data), sleep (computed from accelerometer data) and sociability (described in terms of mobile screen locks and unlocks, calls, and apps usage). Even the active data can be tracked for each single activity performance in each activity category (i.e., questionnaire, audio recording, typing acquisition).

The settings page allows to modify different settings of the tracking and the app. Also, information about the project and the privacy policy are included in this part of the application.

All the functionalities, agreed upon with the clinical partners of the Youth-GEMs consortium, have been further discussed to make them usable by means of a suitable user experience.

The textual messages of the Youth-GEMs application are made available in six national languages (Spanish, Estonian, Finnish, Croatian, Serbian, Dutch).

In the following chapters of this user manual, all these functionalities are described in terms of user experience.

4.2.2 System architecture

Behind the mobile app design, the complete architecture of the Youth-GEMs system is depicted in Figure 2. The overall system includes the Youth-GEMs app (here described) and the PsyMate app (not part of this user manual) as sources of live data; a devoted AI model (not part of this user manual) as the engine to provide clinical operators with additional information; the Youth-GEMs webapp dedicated to the clinical operators to check acquired data and related information coming from the AI model.

The server to collect data acquired with the Youth-GEMs mobile app is part of a virtual architecture set in Frankfurt (Digital Ocean provider).

The server architecture includes a data storage for storing of raw acquired data and a SQL database for storing of users related information including features extracted by the acquired raw data.

The PsyMate app is aimed at EMA (Ecological Momentary Assessment) data collection and the collection is performed by notifying the end users several times a day of selected questions aimed at gaining deep insight into mental health related issues. The PsyMate app is a companion app to the Youth-GEMs app here described, it is not necessary for the use of the Youth-GEMs mobile app, and it is not part of this user manual.

The functionalities of the AI model are also not part of this user manual and are fully independent from the Youth-GEMs mobile app here described.

This user manual deals only with the usage of the Youth-GEMs mobile application.

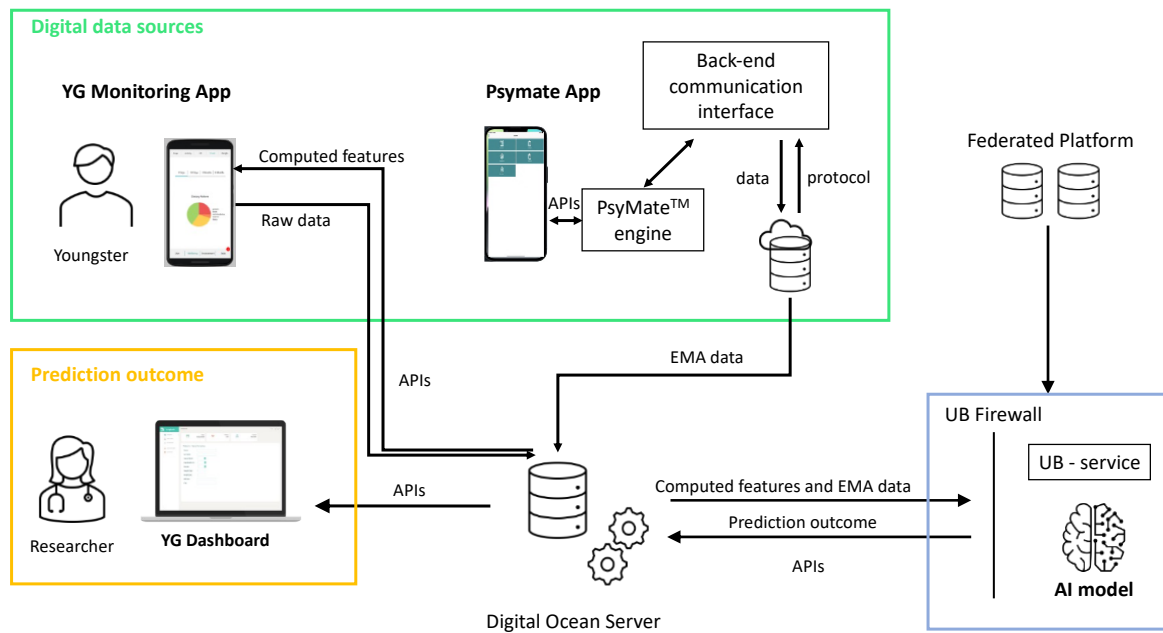


Figure 2: Youth-GEMs system architecture

5. App installation and first usage

NOTICE: this section is intended for the young user and describes the actions he/she needs to perform to correctly use the system.

5.1 App download and installation

The Youth-GEMs application is available on the Apple App Store under the name Youth-GEMs App and on the devoted Ab.Acus repository at youthgemsrepo.ab-acus.com.

To install the app on an Android device, you need to open the youthgemsrepo.ab-acus.com website from your smartphone and tap on the button “Get it from Ab.Acus repo”. If requested (Figure 3), tap on the “Download” button to trigger the download of the app on your phone. Search for and open the installation file. Tap on the “Install” button to start app installation.

NOTE: The phone may suggest you scan the file before installing; tap on “Scan app” button and then on “Install”. Once process it completed, you can tap on “Open” to launch the app.

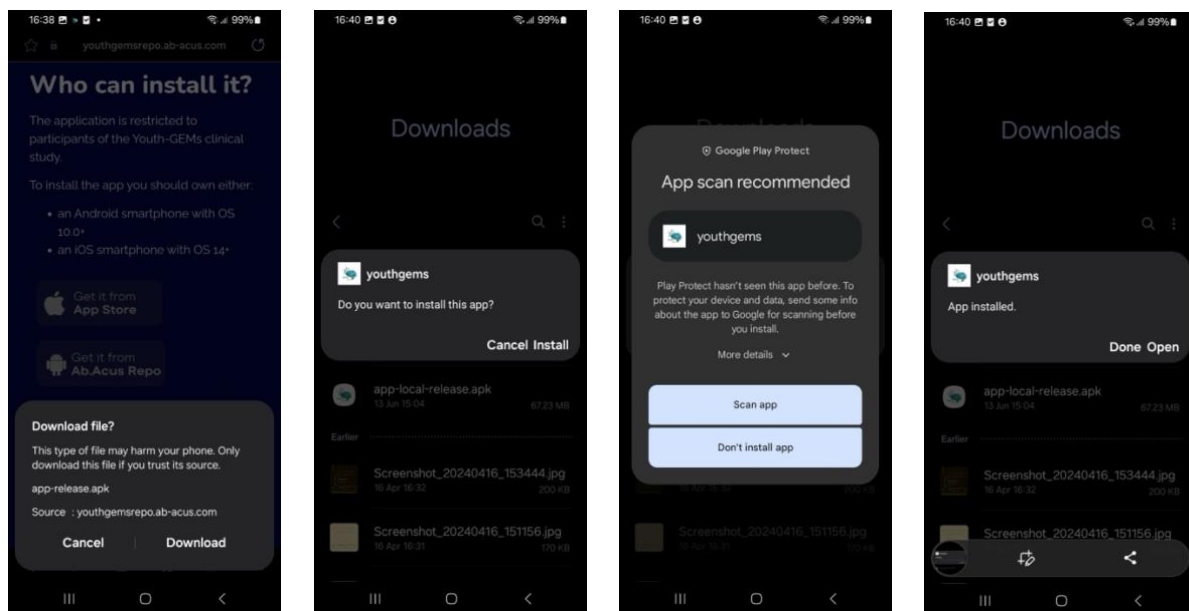


Figure 3: Android system installation process.

5.2 Application launch

If not done already, launch the Youth-GEMs application by tapping on the application icon shown in Figure 4 and available on your homepage.



Figure 4: Youth-GEMs app icon

5.3 Onboarding

At the first launch of the application, you will go through the onboarding procedure where you are informed about the Youth-GEMs project and the main functionalities of the Youth-GEMs application. Carefully read each page and tap on the “Next” button to go to the next one. If you want to come back to a previous page, you can tap on the “Back” button. On the last page of the

Onboarding section, the button “Get started” will show up: tap on it to complete the onboarding procedure. Pages of the Onboarding section are shown in Figure 5.

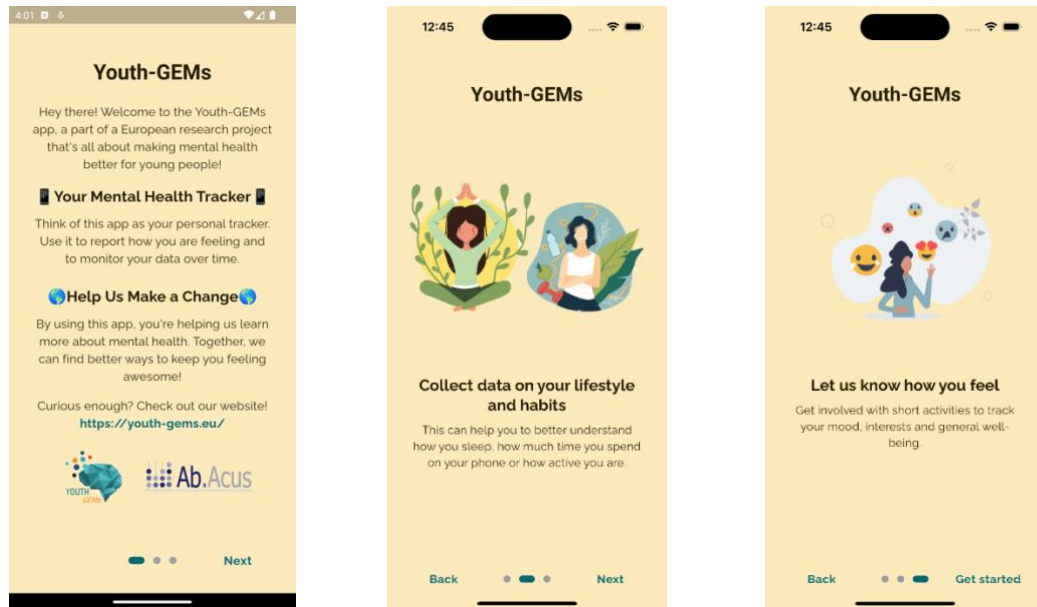



Figure 5: Onboarding pages. From left to right: description of the Youth-GEMs project, monitoring lifestyle functionality, spontaneous activities execution.

5.4 Login

The Youth-GEMs mobile app login page shows up after the Onboarding section during the first launch, while, from the second launch of the application, it is the first page shown right after the launch. Login page is shown in Figure 6.

To correctly log in, fill the fields Username and Password with your credentials. Tap on the  icon to see the inserted password.

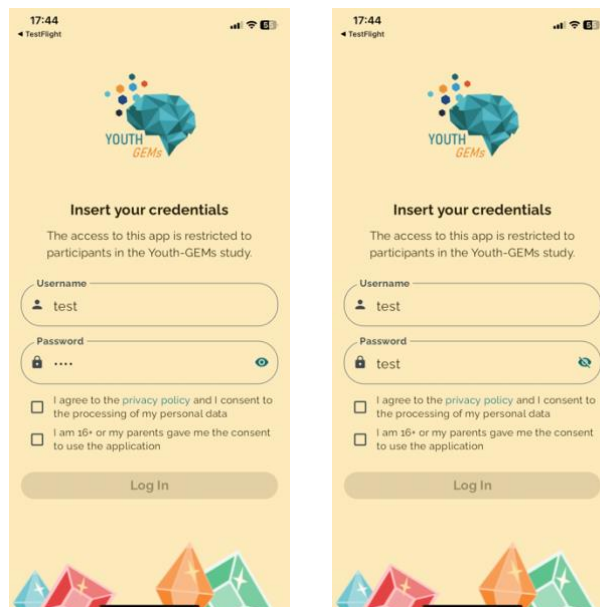


Figure 6: Login page.

By tapping on the text “privacy policy”, you are redirected to a brief summary of the Youth-GEMs app privacy policy as shown in

Figure 7. Read it carefully. If you are interested, you can tap on the link icon that appears at the bottom of the page (scroll down until the end) to be directed to a web page containing the extended policy of the app.

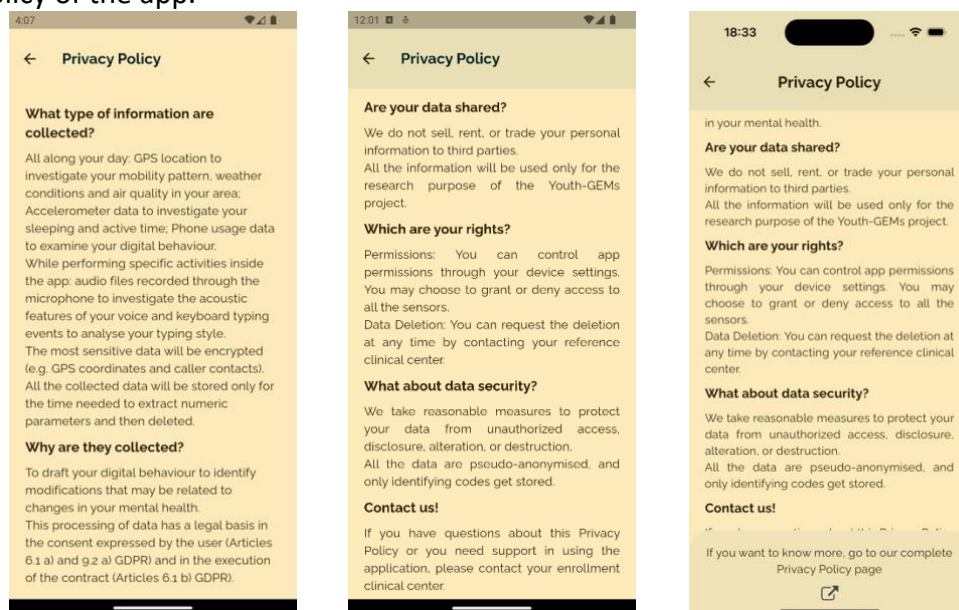


Figure 7: Summary of the Youth-GEMs app privacy policy.

To complete the login procedure, you must flag the two boxes in the login page which state “I agree to the privacy policy and I consent to the processing of my personal data” and “I am 16+ or my parents gave me the consent to use the application”.

NOTE: if you are under 16, you need to ask your parents or legal guardian for the consent to use the application.

After flagging both the checkboxes, the “Log In” button will be enabled, as shown in Figure 8. Tap on the button. If you inserted the correct credentials, a pop up should appear asking you if you want to save your credentials. Tap on “Yes” to have them memorized the next time you log in the app.

If you did not insert the correct credentials or if you have internet connection issues, a message should appear informing you of the problem. Go to the *Troubleshooting guide* of the manual to proper manage it.

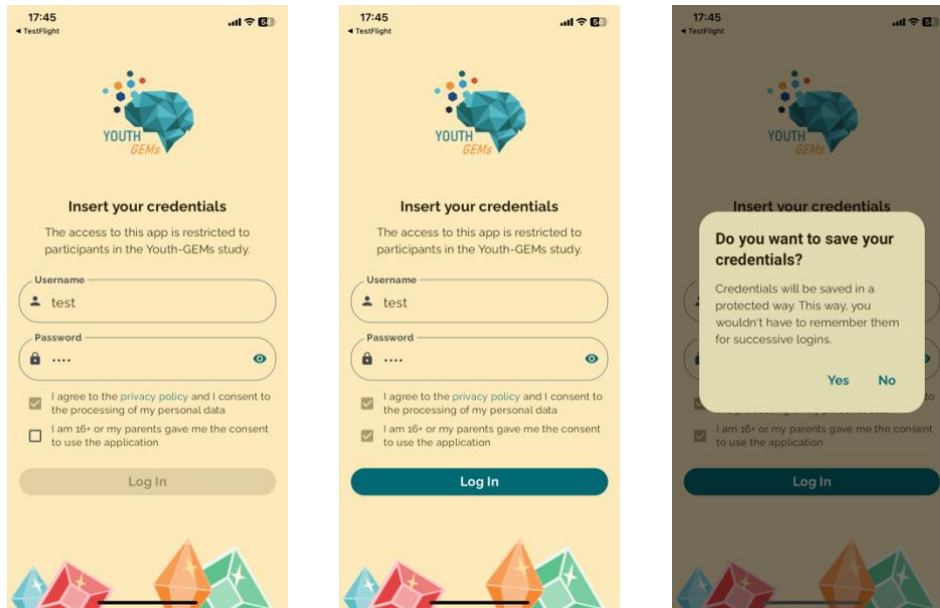
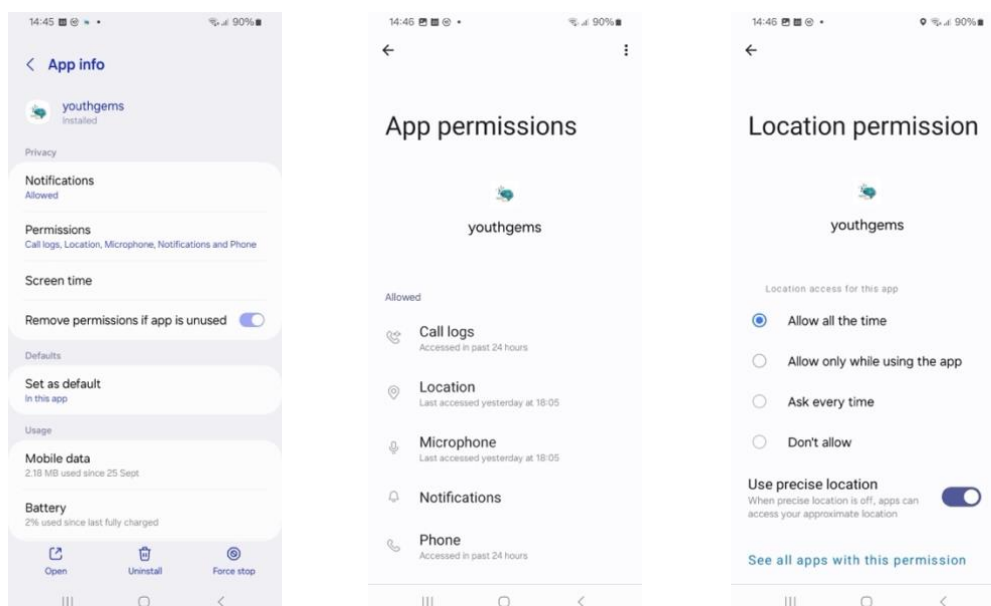


Figure 8: Left - Login page with credentials inserted and Privacy Policy box flagged. Middle – Login page with both boxes flagged and log in button enabled. Right – pop up to save account credentials.

5.5 Personalization – smartphone sensors

The personalization section of the app is shown only after the first log in. In the Personalization section you are asked to decide which data acquisition configuration you want inside the application. Each page of the Personalization section presents a different functionality of the application that involves data collection: you are asked to choose if you want this functionality to collect your data or not. You will be able to change this configuration at any moment inside the application in the settings (see the 7.3 *Track Settings* page description in this manual). We suggest choosing “Yes” to all the Personalization sections for a complete app usage experience.



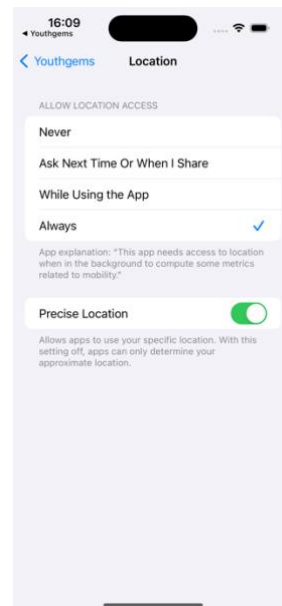
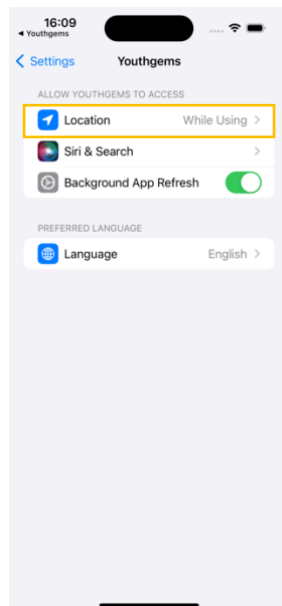
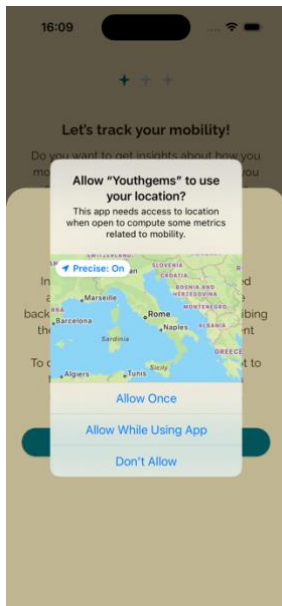
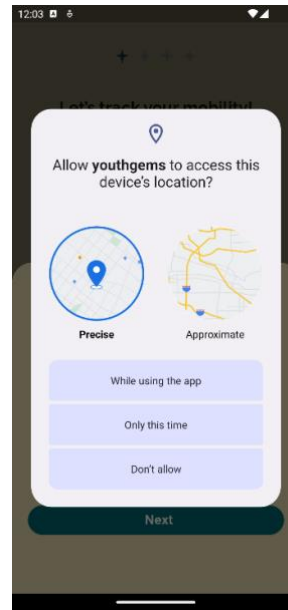
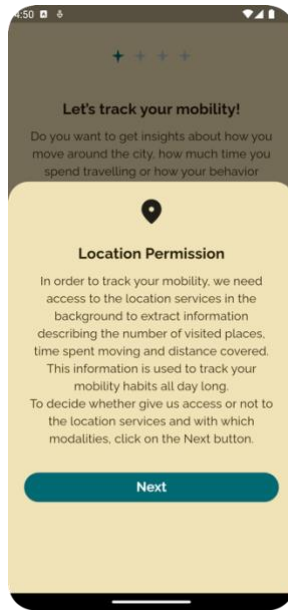
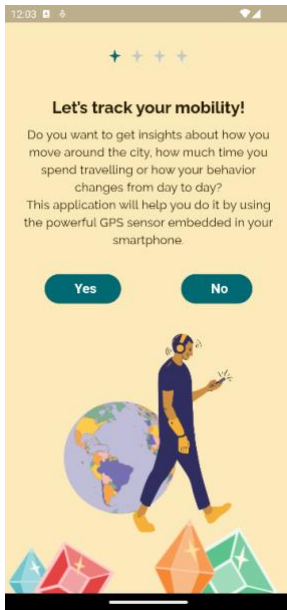


Figure 9: Personalization - mobility page and GPS permission request for Android (up) and iOS (down)

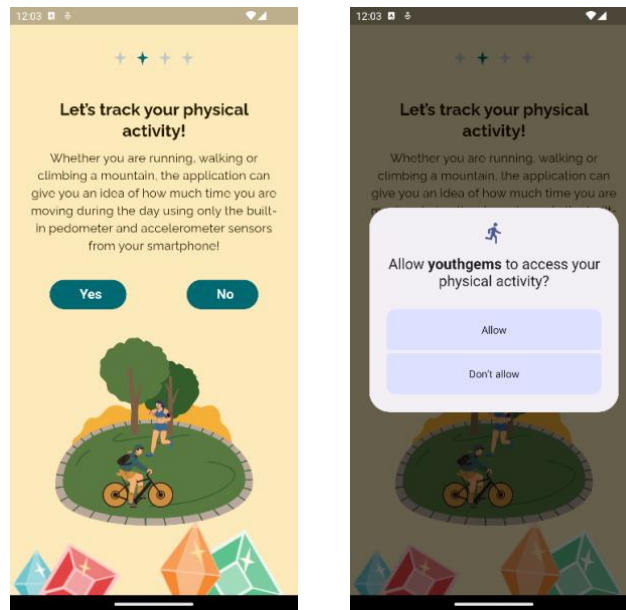


Figure 10: Personalization - physical activity page and physical activity permission request

The first page of the Personalization asks if you are interested in tracking your mobility habits (see **Error! Reference source not found.**). Tap on the “Yes” button if you want to activate this feature, otherwise tap on “No”. If you tap on “Yes” you are shown a text explaining that the mobility tracking feature involves the collection of location data from the GPS sensor embedded in your smartphone. By tapping on the “Next” button you are asked to provide specific permission to access the Location data of your smartphone. The location permission page(s) may be different for different smartphone brands and operating systems. We suggest providing the broadest permission (e.g. always rather than when using the app) to have a better app usage experience. To provide the ‘always’ permission on Android devices you need to navigate the phone settings as shown in Figure 9: app info → permissions → app permissions → location → Allow all the time. To provide the ‘always’ permission on iOS devices you need to go to the app settings and select: Location → Always.

The second page of the Personalization asks if you are interested in tracking your physical activity (see Figure 10). Tap on the “Yes” button if you want to activate this feature, otherwise tap on “No”. If you tap on “Yes” you are asked to provide specific permission to access the physical activity data of your smartphone.

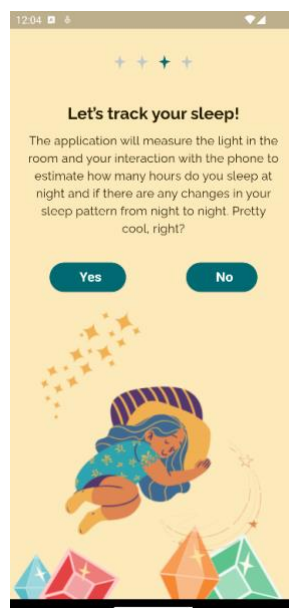


Figure 11: Personalization - sleep habits page

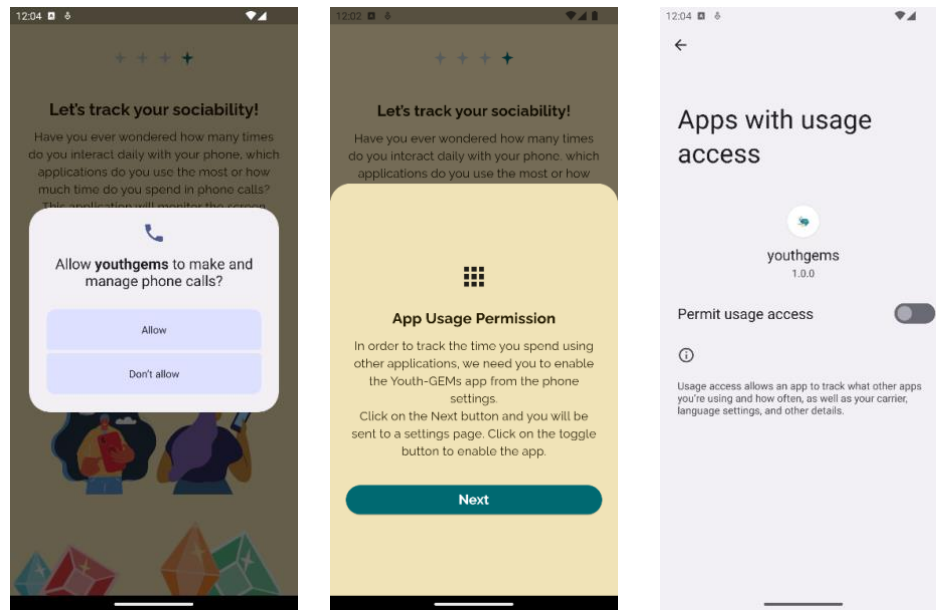
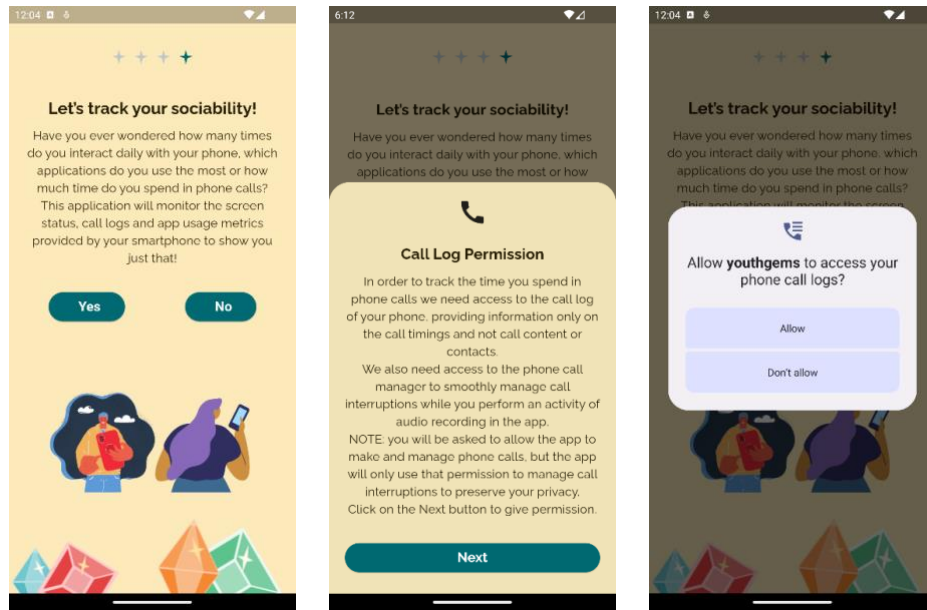


Figure 12: Personalization - sociability page and permissions request

The third page inquires about your permission to track your sleep habits (see Figure 11). Sleep habits are computed by looking at the data coming from different sensors embedded in your phone like the accelerometer recording the motion of the phone or the light sensor evaluating environmental light.

The fourth page of the Personalization is displayed only to Android users and asks if you are interested in tracking your sociability (see Figure 12). Tap on the “Yes” button if you want to activate this feature, otherwise tap on “No”. If you tap on “Yes” you are asked to provide specific permission to access the call log of your smartphone and the app usage information. The procedure to provide app usage permission may be different for different brands and operating systems.

5.6 Personalization – wearables

If you have enrolled to the extended protocol, you will be asked to give some extra permissions to access data from your wearable device. First, you will be asked to connect your Wear OS device (if you have one). Tap on 'yes' (Figure 13) and proceed with providing latest permissions. Then, when you have successfully reached the home page, follow instructions on your Wear OS device (see the section 5.8 *Set up of Wear OS app*).

If you own a different wearable device, tap on 'No' and proceed with permission flow, which is different for Android and iOS users.

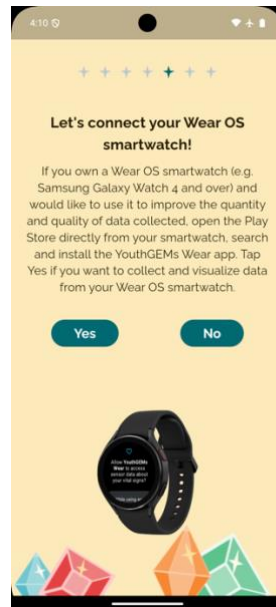
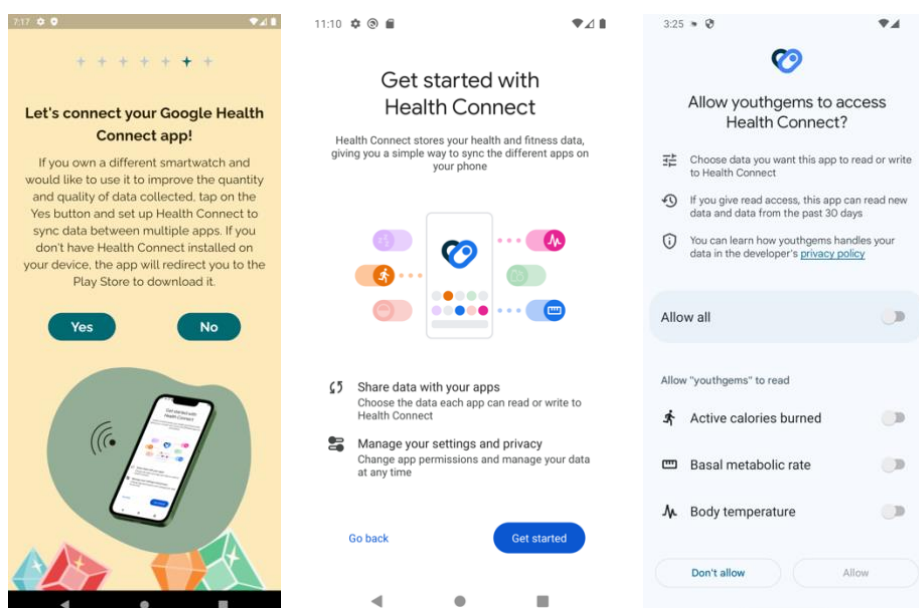


Figure 13: Personalization – wear OS device pairing page.

5.6.1 Google Health Connect (Android)

If you own an Android device, you will be asked to connect your Google Health Connect app to allow the sharing of extra data such as Heart Rate, Active Calories Burned, Body Temperature and more. Tap on "yes" and, if you already have the Health Connect app installed on your device (it is part of the Android system from Android 14) you will see a page with a short description of the app. Tap on the "Get started" button to start connecting the app, then toggle the "Allow all" button to provide the Youth-GEMs app the permission to access all extra data from Health



Connect (Figure 14). Finally, tap on “Allow” and you will return to the application to complete the set up.

Figure 14: Google Health Connect permission screens.

For OS versions below 14, tapping on the “yes” button will open the Play Store page to install the Health Connect app. Tap on “Install” and, when installation is completed, go back to the app and follow the same procedure described above to provide permissions. After completing the permissions flow, see section 5.8 *Set up of connection between Google Health Connect and Fitbit* to allow data sharing from the companion app of your wearable device.

5.6.2 Apple Health (iOS)

If you own an iOS device, next you will be asked to connect your Apple Health app to allow the sharing of extra data, such as Heart Rate, Active and Resting Energy, Respiratory Rate, Body Temperature and more. Tap on “yes” and it will open a pop up requesting all data permissions.

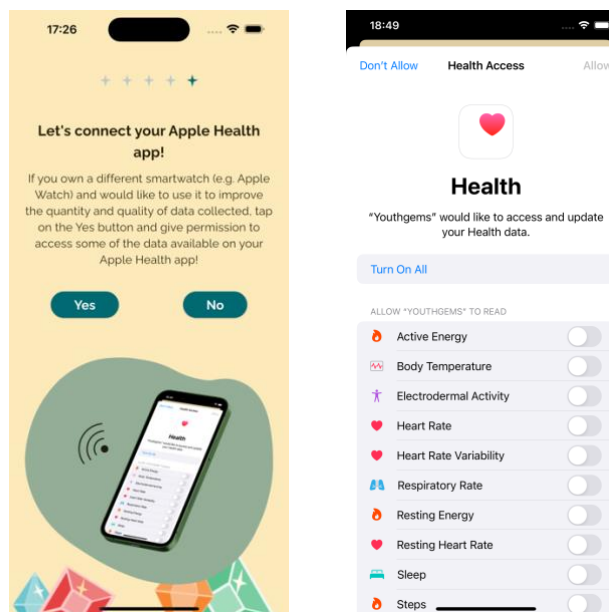


Figure 15: Apple Health permission screens.

Tap on “Turn On All” and then on “Allow” at the top right of the pop up.

5.7 Personalization – battery and notifications

The last step of the permissions setup is the request to ignore battery optimization (only for Android) and to enable notifications (see Figure 16).

By accepting to ignore battery optimization, you can allow the app to run a long-lasting data collection and reduce OS interferences. In some device models it is a simple pop-up, while in others it is a settings page where to select Battery → Unrestricted.

Notifications are used within the application as reminders of activities to be performed (see 6.1.1 *My life tracker* section), as reminders to re-open the app for restarting data collection and to inform you on the status of the data collection service (see *Background data collection* section).

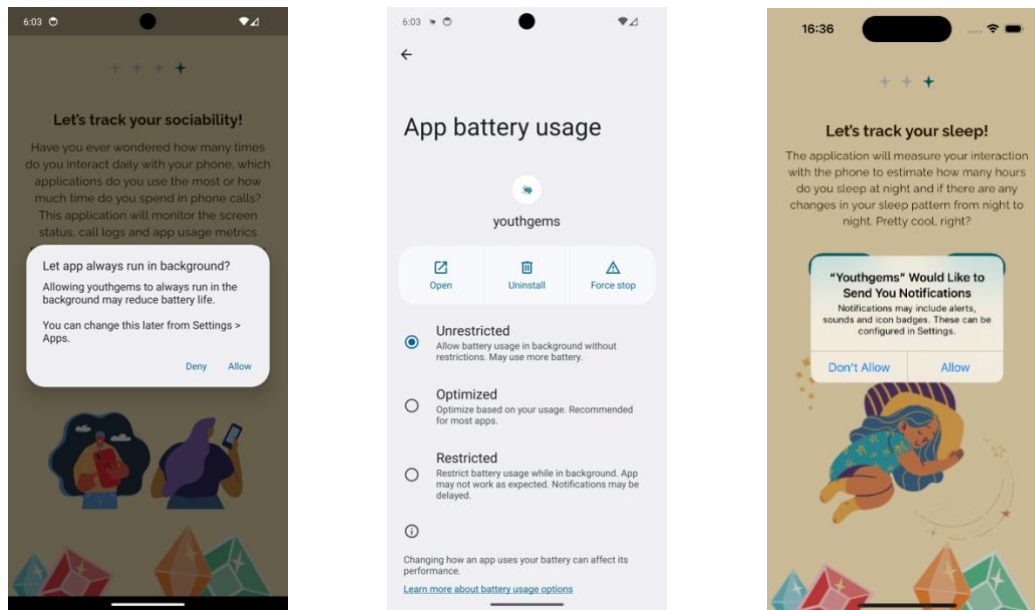


Figure 16: Left –Ignore battery optimization pop up. Middle – Battery unrestricted from settings. Right - Notification permission request

5.8 Set up of Wear OS app

To begin using the Youth-GEMS Wear app on your wearable device, open the Play Store directly from your device and search for Youth-GEMS Wear (Figure 17). Make sure to type the name exactly as shown, paying attention to upper and lowercase letters.

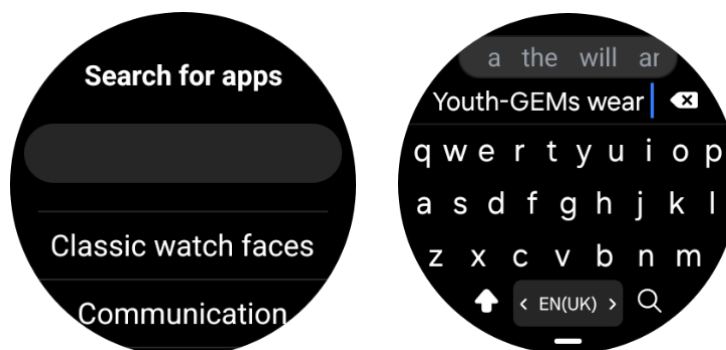


Figure 17: Play Store search from wearable device.

Once you've found the app:

- Tap “Install”
- When prompted, allow all permissions (physical activity, notifications and vital signs) so the app can function correctly (see
- Figure 18).

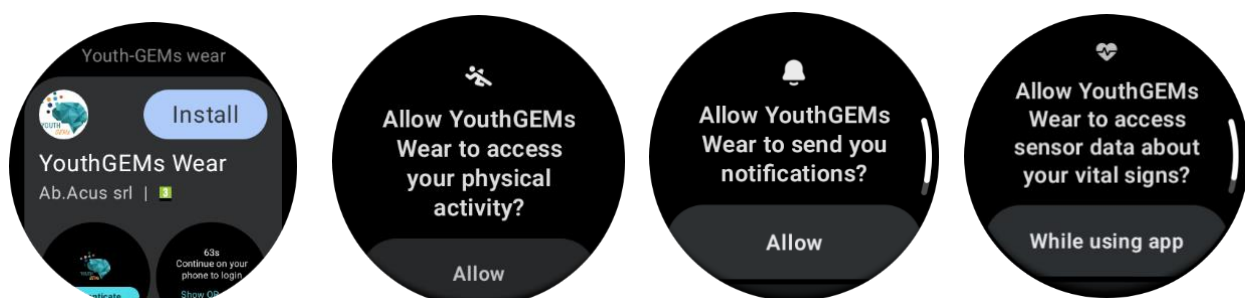


Figure 18: Permission flow on the Youth-GEMS Wear app.

After providing permissions, you need to log in to access the main screen. Tap the “Authenticate” button on the main screen: a web page will open automatically on your paired smartphone. If that doesn’t occur, you can tap on “Show QR code” (Figure 19) and scan the QR code that appears on the device from your smartphone, which will open the same web page.

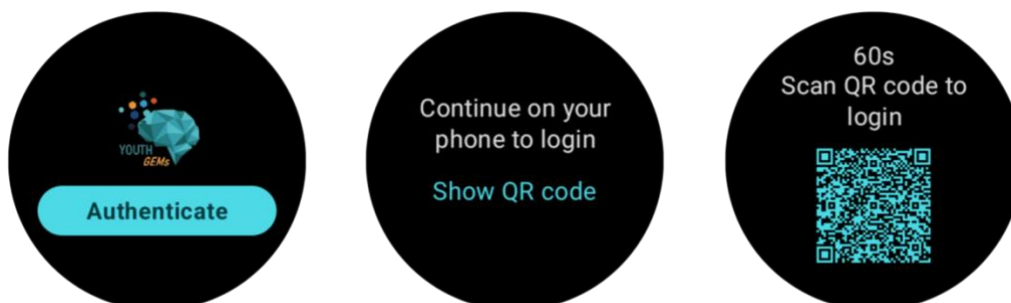


Figure 19: Authentication flow on the Youth-GEMs Wear app.

Log in with your credentials (the ones used for the mobile application). Once authentication is successful, you will be redirected back to the main screen of the app on your wearable device. After logging in, you’ll land on the home screen. The central button marked “Start service” allows you to begin data acquisition. Tap it once to start and tap it again if you wish to stop the session at any point.

Beneath the Start/Stop button, you’ll find three icons:

- Log out: tapping this will log you out of the app and bring you back to the authentication screen;
- Set reminder time: opens a screen where you can select the exact time of day you wish to receive a daily reminder to start data acquisition. You’ll see two vertical scroll pickers to help you set the time precisely (Figure 20);
- Metrics viewer: opens a page that displays your daily step count and heart rate.

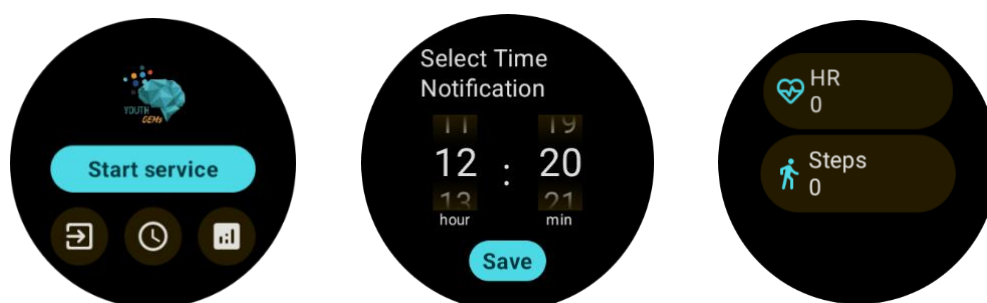


Figure 20: Main features of the Youth-GEMs Wear app – start/stop acquisition, set reminders, view metrics.

5.8 Set up of connection between Google Health Connect and Fitbit

Now we have the Youth-GEMs app connected to Google Health Connect, but we need to make sure that Google Health Connect is connected to your wearable app (e.g. Fitbit, Polar Flow) so that the data stream can work properly. Following is reported the list of the companion apps supported by Google Health Connect (Table 1).

APP	WEARABLE
OHealth	OPPO, OnePlus Watch 2
Dexcom G6	CGM Dexcom G6
Dexcom G7	CGM Dexcom G7
Withings	Scanwatch series
Oura	Oura Ring
COROS	Vertex, Apex and Pace series
Polar Flow	Polar Smartwatch
Samsung Health	Samsung Devices
Mobvoi Health	TicWatch
WHOOP	WHOOP
FitBit	Smartwatch FitBit
Ultrahuman	Ultrahuman Ring

Table 1: list of companion apps supported by Google Health Connect

NOTE: here we suggest connecting **Fitbit** devices, since they have been properly tested in the integration flow. Other devices may behave differently, and the integration may not be successful.

If you own a Fitbit, open the Fitbit companion app and check if a pop up is displayed on top of main page asking to browse data from Health Connect. If it is not available, route to the page of connected devices and check if Health Connect is already included in the connected devices list (Figure 21). If not, you should see under “Add connections” the card titled Health Connect. Tap on “Set up Health Connect” and you will see a page explaining how connection works and a button “Set up”. Tap on the button and then agree to the syncing of data tapping “I agree”.

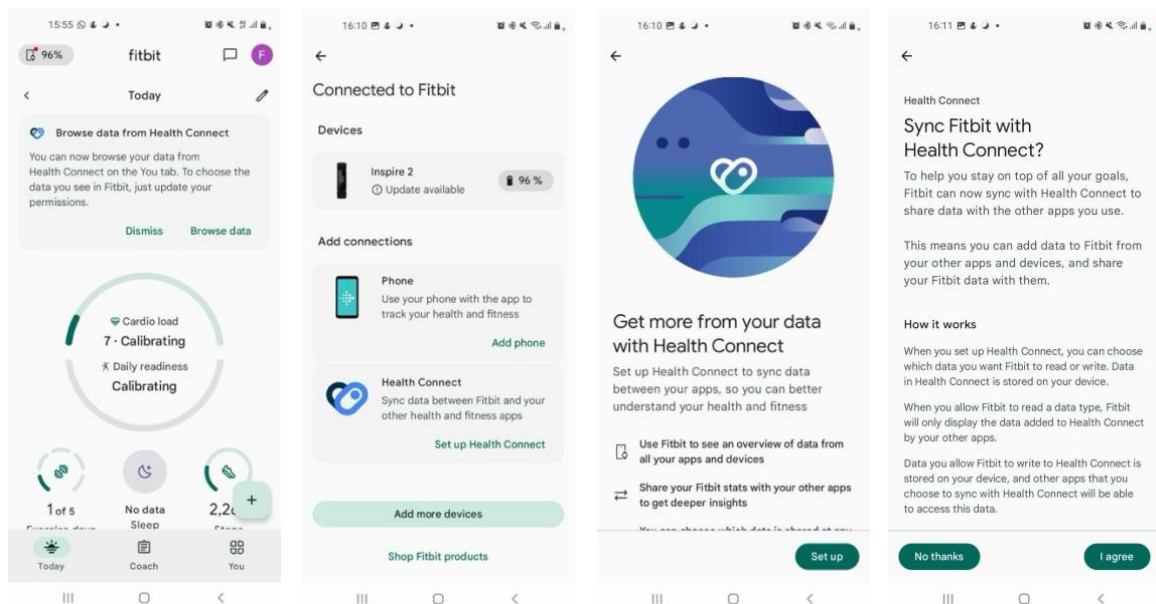


Figure 21: Fitbit connection flow with Google Health Connect.

After that, a page like the one displayed within Youth-GEMs will be shown to provide permission to Fitbit to share your Fitbit data with Google Health Connect.

Here you can tap on “Allow all” and then on “Allow” and if everything was performed correctly, a final page of connection succeeded is displayed (Figure 22).

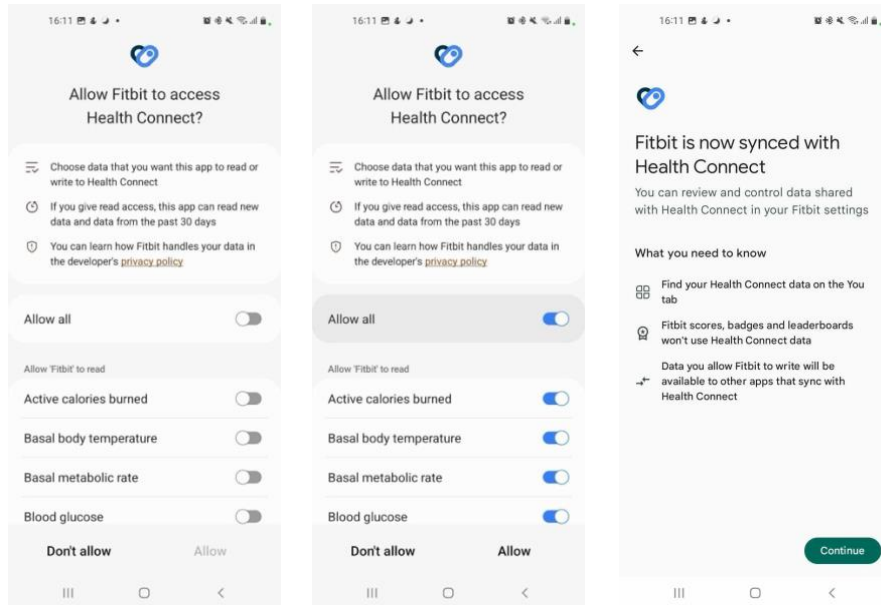


Figure 22: Permissions flow within Fitbit app.

As a final check that connection was successful from both side (Youth-GEMs and Fitbit apps), you can search for the Google Health Connect app from your phone settings or from the Play Store and check under “App permissions” if both *youthgems* and *Fitbit* are listed under “Allowed access” (Figure 23). Moreover, you can search “Recent access” if you see that Fitbit has written some data and youthgems has read them. If you don’t see any Fitbit access, try opening the Fitbit app and start data syncing.

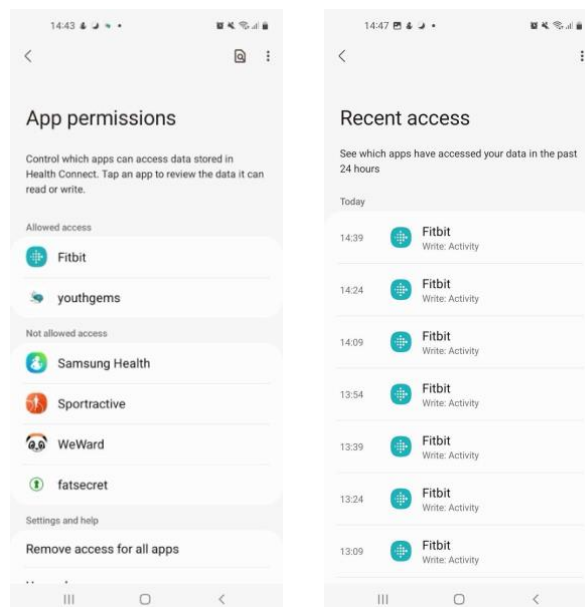


Figure 23: Google Health Connect list of connected apps.

6. Daily usage

NOTICE: this section is intended for the young user and describes the actions he/she needs to perform to correctly use the system.

6.1 Activities

The Activities page (see Figure 24) is the first one showing up after the personalization process for the first access, and it is the first one showing up after the login for the other accesses. On this page you will find activities that you can execute daily. Pressing the information button, you will get full description of the activities. When an activity is not available (because you have already performed it on the same day) you get a warning message.

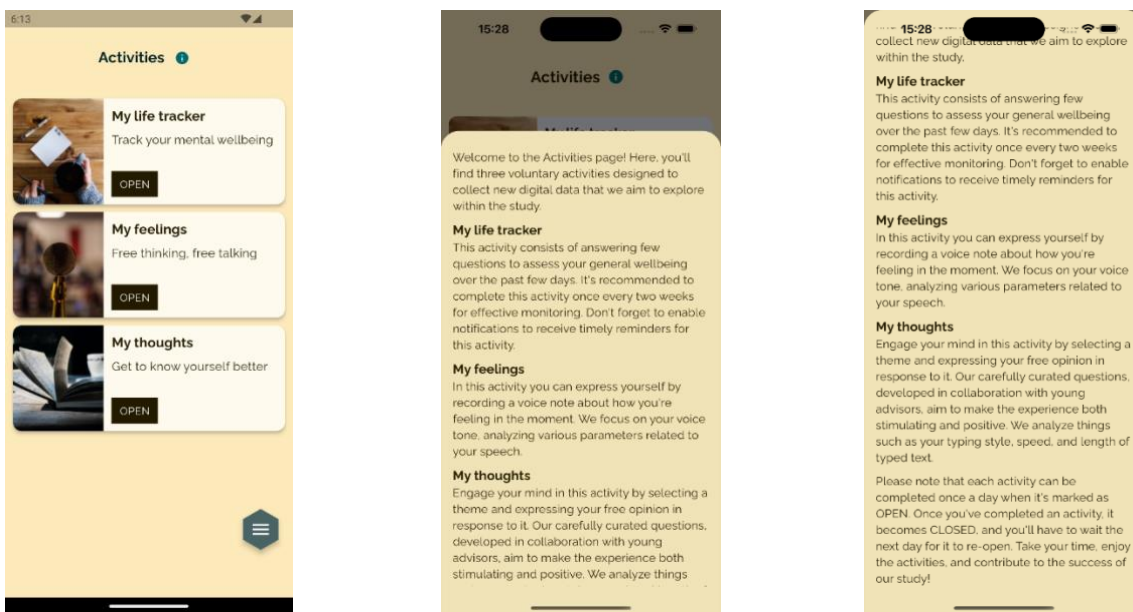


Figure 24: Activities page

6.1.1 My life tracker

“My life tracker” activity allows you to answer some questions about your wellbeing through a scientifically validated questionnaire (see Figure 25).

The questionnaire consists of five general questions about your wellbeing. Once selected the activity, the first question is shown. You must answer on a scale from 0 to 100 by moving the slider. When you have scored the first question, the “Next” button is enabled to allow you to move to the second one and so on. From the second question onward, you may also move back to previous questions by tapping the “Back” button.

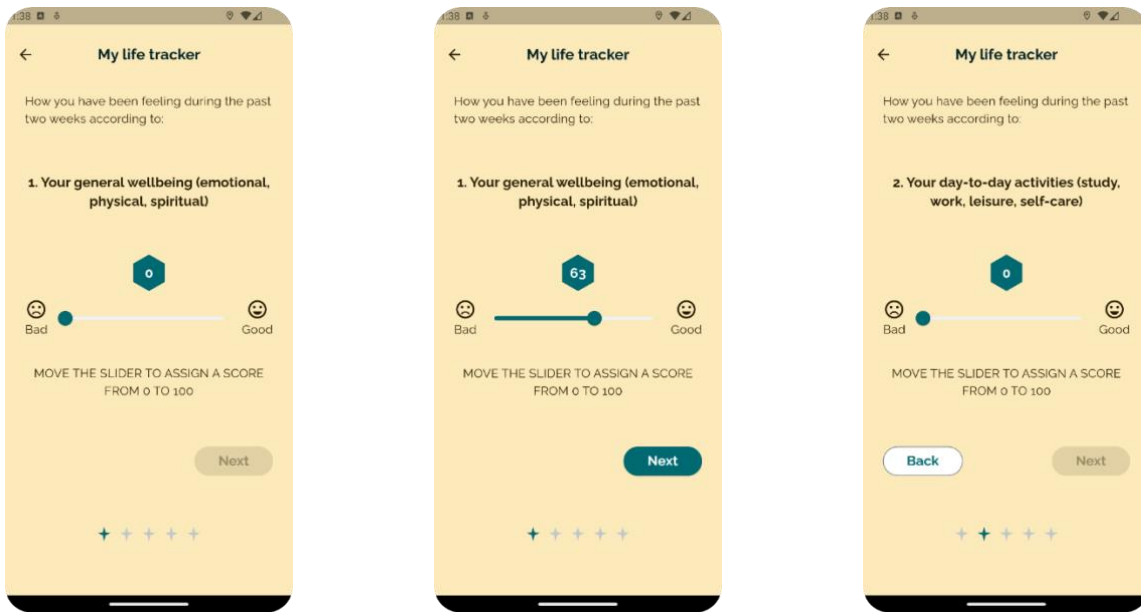


Figure 25: My life tracker questionnaire

Once the questionnaire is completed, all the scores are displayed, and you may decide to send them or going back to questions (Figure 26).

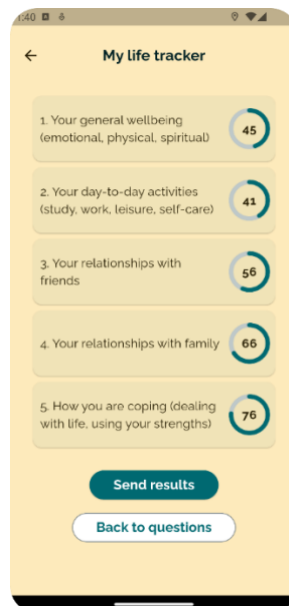


Figure 26: My life tracker final page

6.1.2 My feelings

By selecting “My feelings” activity from the “Activities” page, you are redirected to the page displayed in Figure 28. Here you are requested to record your voice while answering the question “What color are you feeling today? Describe in a few sentences why you chose that color”. To start the recording, tap on the microphone icon.

The first time you will be shown a pop up explaining you need to provide permission to the microphone to record your voice. Android users will also have to give permissions (if not already done in the personalization section) to the phone call manager to effectively manage call interruptions during the audio recording (see pop ups in Figure 27).

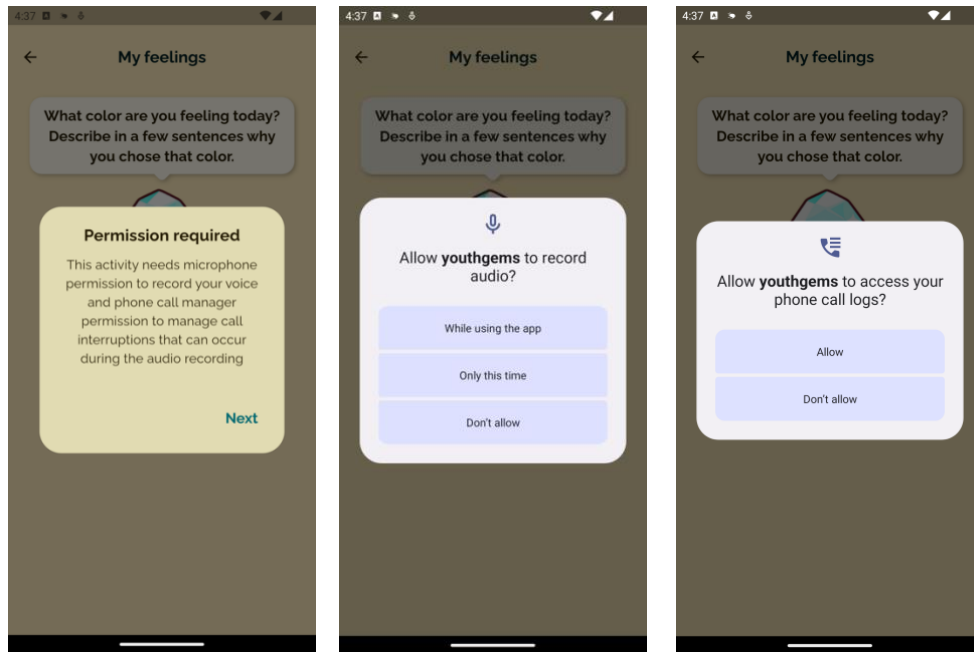


Figure 27: Microphone and call log permission pop ups.

After all permissions have been properly provided, the timer will start, and your voice will be recorded. The microphone icon will be changed to a square icon that you have to tap to stop the recording. Once you finish, you may listen to your recording before sending and if you are not happy with it, you may delete it. Otherwise, you may send it. Tap on the “Send” button to complete the activity. This activity is a daily activity, so if you do it, it will become available again only the day after.

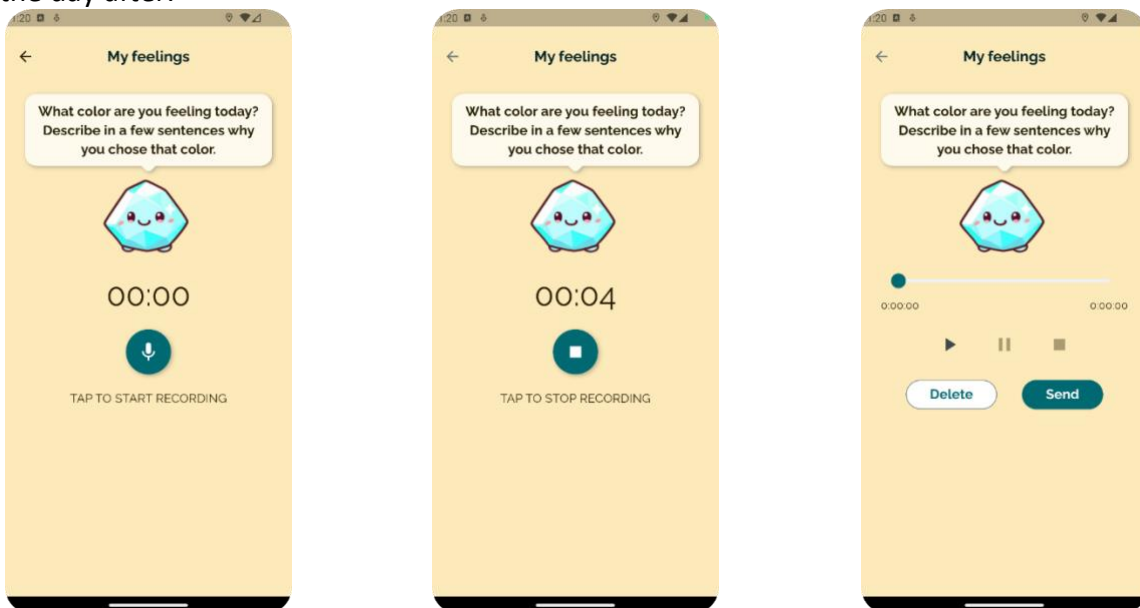


Figure 28: My feelings activity. Left – start recording. Middle – stop recording. Right – play the recorded audio.

6.1.3 My Thoughts

By selecting the “My thoughts” activity from the “Activities” page, you are redirected to the page displayed in Figure 29. Here, you are asked to select a question to answer among three choices. To select the question, you have just to tap on it. Then, you may input your answer in a devoted text box. Emojis and other graphical stuff are not allowed, only text with a maximum of 1000 characters. Once you have completed your text, you may tap the button “Send” to submit it.

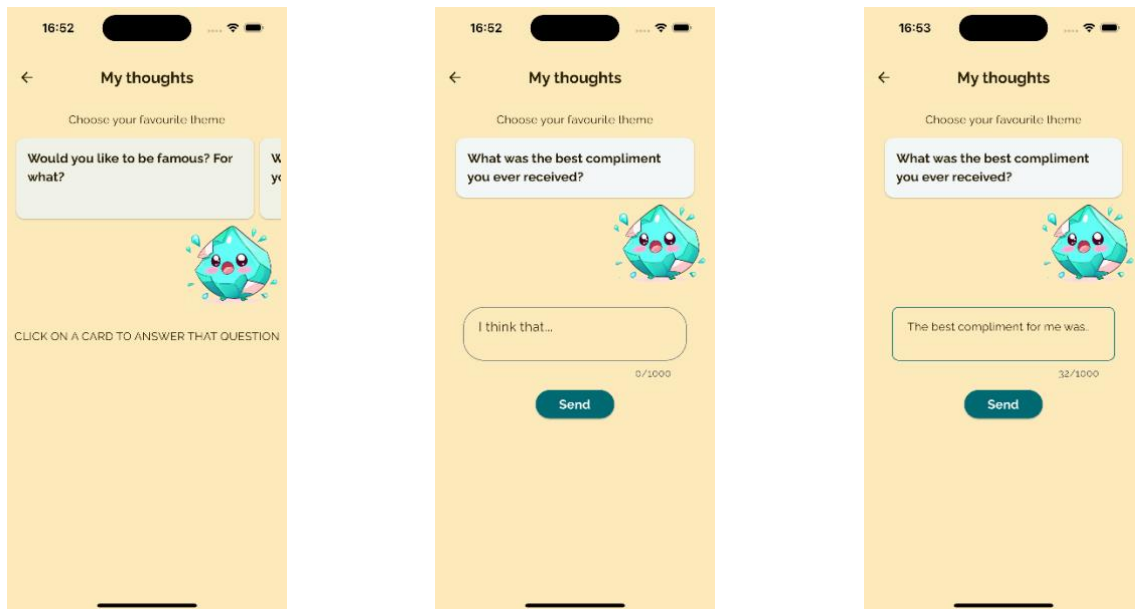


Figure 29: My thoughts activity

6.2 Navigation

To navigate from the “Activities” page to other pages, you must tap the routing button in the bottom right part of the screen (Figure 30). Once the button is tapped, a complete menu is displayed. The menu allows to access the “Activities” page (that we already described), the “Tracking” page to track your lifestyle from the sensorial data and the “Settings” page to change general settings of the applications.

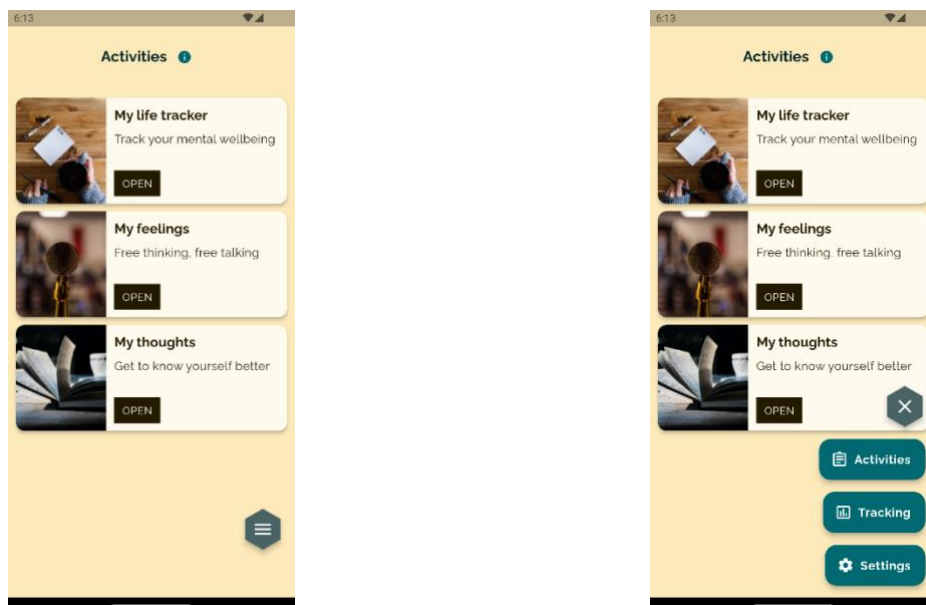


Figure 30: Navigation through sessions

6.3 Tracking

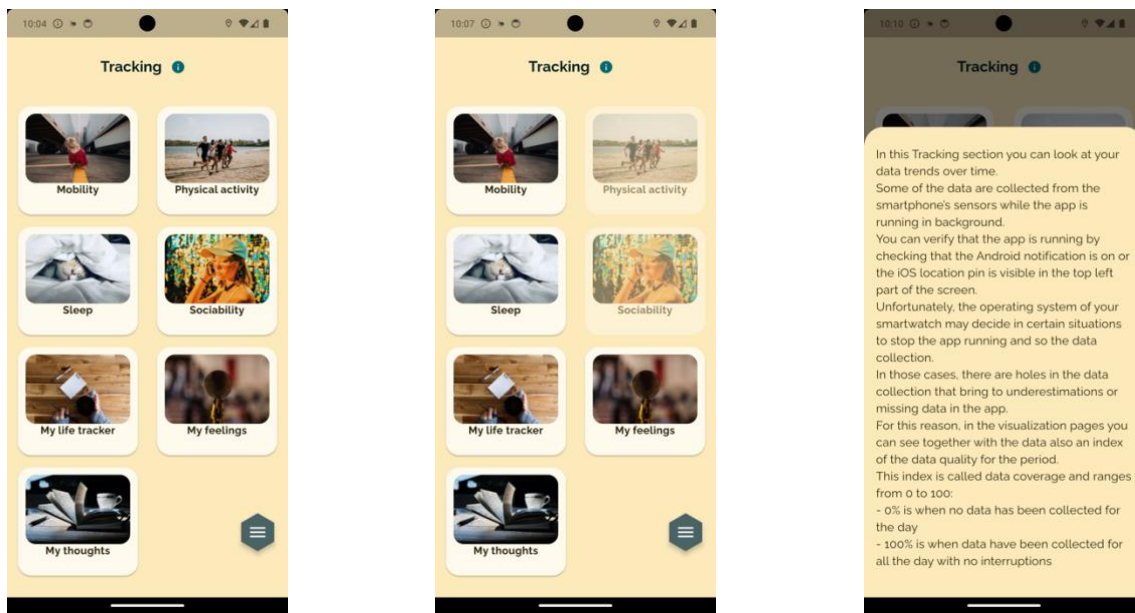


Figure 31: Tracking page

The Tracking page allows you to access all the data that are acquired by means of the Youth-GEMS app for their visualization. The cards you may access in this page are labelled “Mobility”, “Physical Activity”, “Sleep”, “Sociability”, “My life tracker”, “My feelings”, “My thoughts”.

NOTE: The “Sociability” card is only available to Android users.

These items include both all the data collected in background and the data coming from the voluntary activities of the “Activities” page. Tapping the information button, you will get full description of how to check data are properly collected and how to interpret data missing. When data are not available because you decided in the personalization section to not collect them, the relative card is blurred and, when you tap on it, a warning message is displayed (Figure 32 - a).

If you expressed your interest in collecting a certain type of data but did not provide all the permissions required for a proper acquisition, another pop-up message will be shown giving you the possibility to enable the required sensors (Figure 32– b). Moreover, if you provided all the permissions required to collect a certain type of data but, after that, you stopped the actual collection from the “Track Settings” page (see dedicated section), a different type of pop up will be presented giving you the possibility to re-activate the data collection (Figure 32 – c).

Finally, for what concerns data related to the activities that can be performed within the app, if no activity was performed ever, a message will be displayed informing there are no data to show (Figure 32 – d).

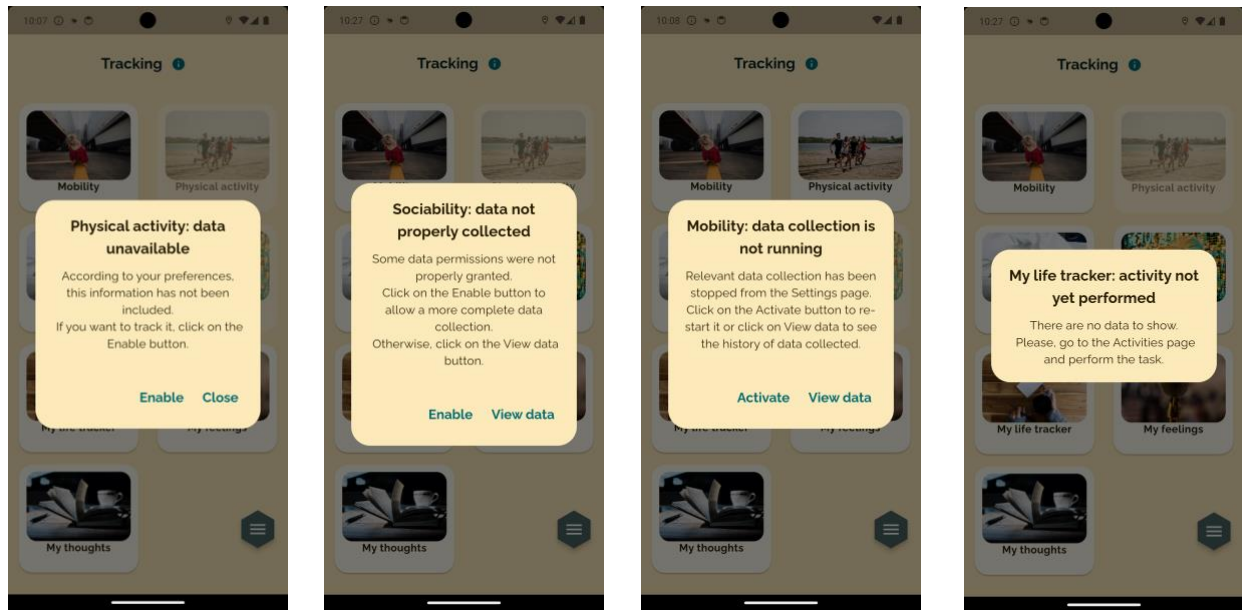


Figure 32: a – data not available pop up; b – data not properly collected pop up; c – data collection is not running pop up; d – activity not yet performed pop up.

6.3.1 Mobility

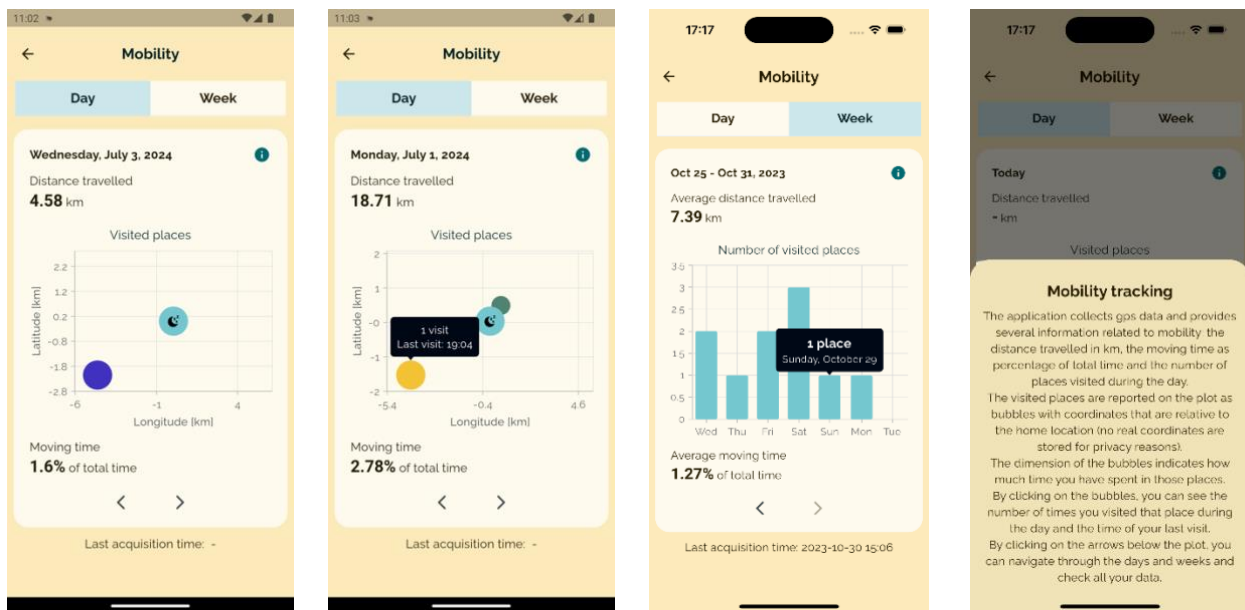


Figure 33: Mobility page

Within the “Mobility” page, the GPS data are displayed (Figure 33). Data are displayed day by day in terms of bubbles showing the most visited places. For each place, the number of visits and the time overall spent there are displayed. Moreover, daily distance travelled, and percentage of moving time are also shown.

Data are displayed also on a weekly base where, for each date, the number of visited places is reported. A general information on average distance travelled and moving time over the week are reported. Tapping the information icon, a brief description of the data is reported. In the upper part of the page, you can select if you want a day/week visualization. Below the graph you can navigate back and forth in time using the left and right arrows.

6.3.2 Physical activity

Within the “Physical Activity” page, the accelerometer data (describing the movement of the phone) plus steps are displayed (Figure 34). Data are displayed day by day in terms of columns showing the activity in percentage on the total time hour by hour, that means that 100% indicates that the phone has been moving for the entire hour rather than subperiod (e.g. 10%, 50%, ...). Moreover, an indication on the total steps performed is provided above the plot.

Only for Android users, under the plot an indication is provided on data coverage, which is the percentage of time data was properly collected over the 24 hours.

Data are displayed also on a weekly base where, for each date, the daily activity, always as a percentage of the overall time, is reported, together with the average number of steps. Tapping the information icon, a short description of the data is shown. In the upper part of the page, you can select if you want a day/week visualization. Below the graph you can navigate back and forth in time using the left and right arrows.

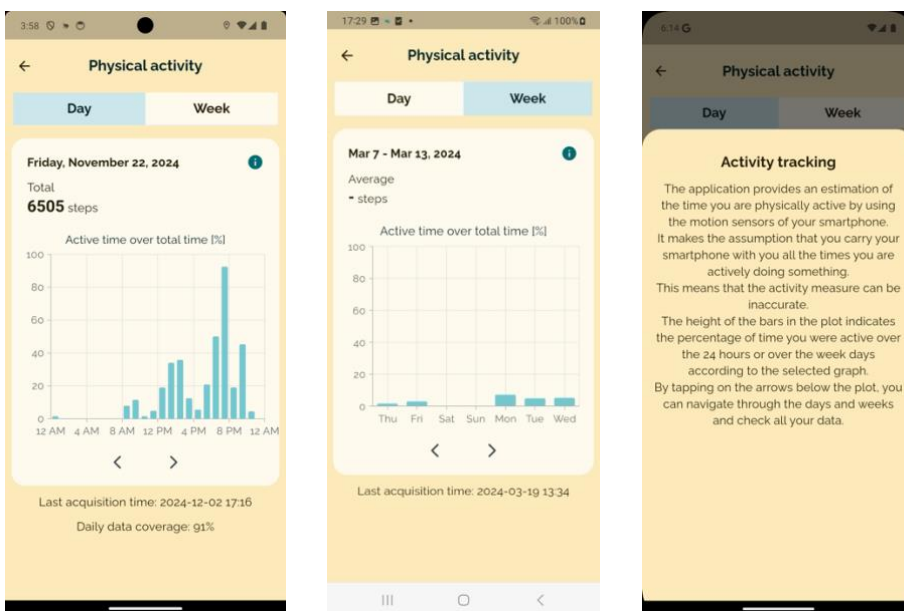


Figure 34: Physical activity page

6.3.3 Sleep

Within the “Sleep” page, the sleep time computed by looking at the behavior of several sensors like the phone movement, the environmental light (when available), and the phone usage is displayed (Figure 35). Data are displayed on a weekly basis in terms of columns showing the sleep interval (sleep onset, awake time, and sleep duration). If some awake periods are identified during the night, a double information on time in bed and time asleep is provided. Moreover, only for Android users, the tooltip on the chart also provides an estimation of the data coverage during night, that can be used to evaluate the goodness of the sleep computation (Figure 35 - middle). Tapping the information icon, a brief description of the data is shown. Below the graph you can navigate back and forth in time using the left and right arrows.

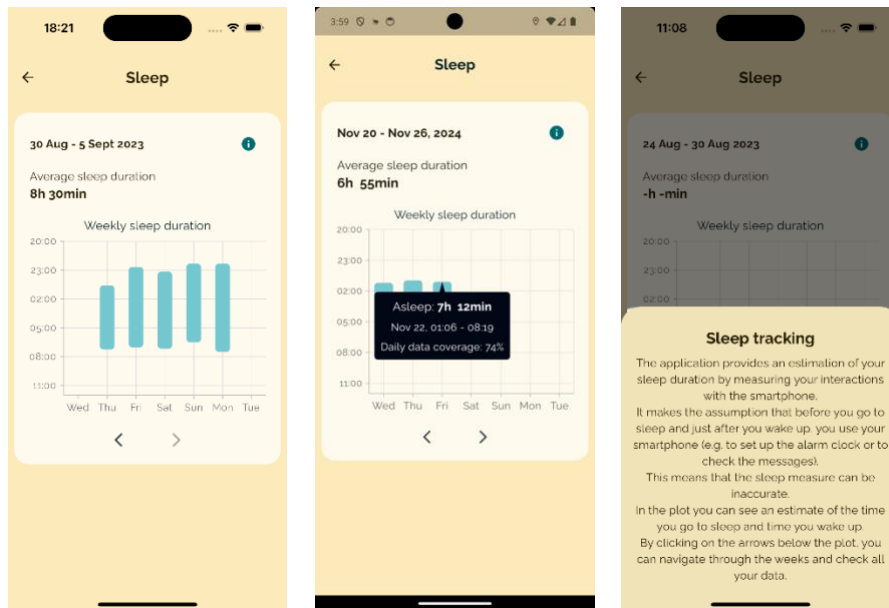
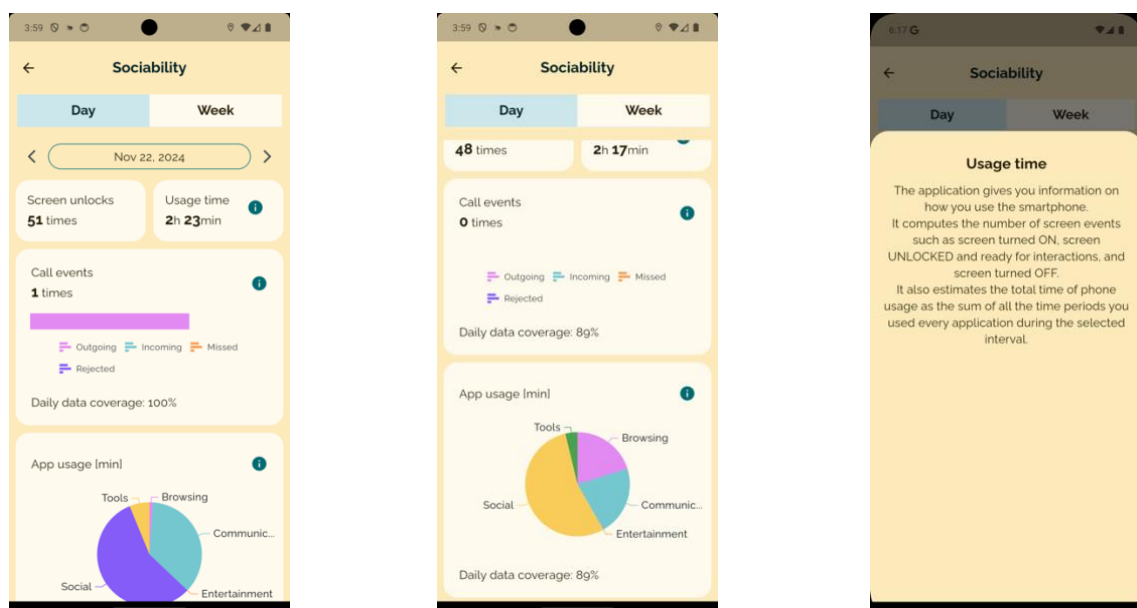


Figure 35: Sleep page

6.3.4 Sociability

Within the “Sociability” page (available only for Android users), the data describing the phone usage, both in terms of performed calls and apps usage are displayed (Figure 36). Data are displayed on a daily and weekly base. Within the day visualization, the total time of phone usage and the number of screen unlocks are also reported. Moreover, for both the call events and app usage information, an indication of data coverage over the 24 hours is reported. Referring to the usage of apps, no information is saved and displayed on the single application, but the total amount of time for category (i.e. communication, browsing, games, entertainment,) which applications belong to is displayed. Tapping the information icon, a brief description of the data is shown both for the calls and the apps. In the upper part of the page, you can choose between a day or week visualization, and you can navigate back and forth in time by tapping on the left and right icons next to the date indication.



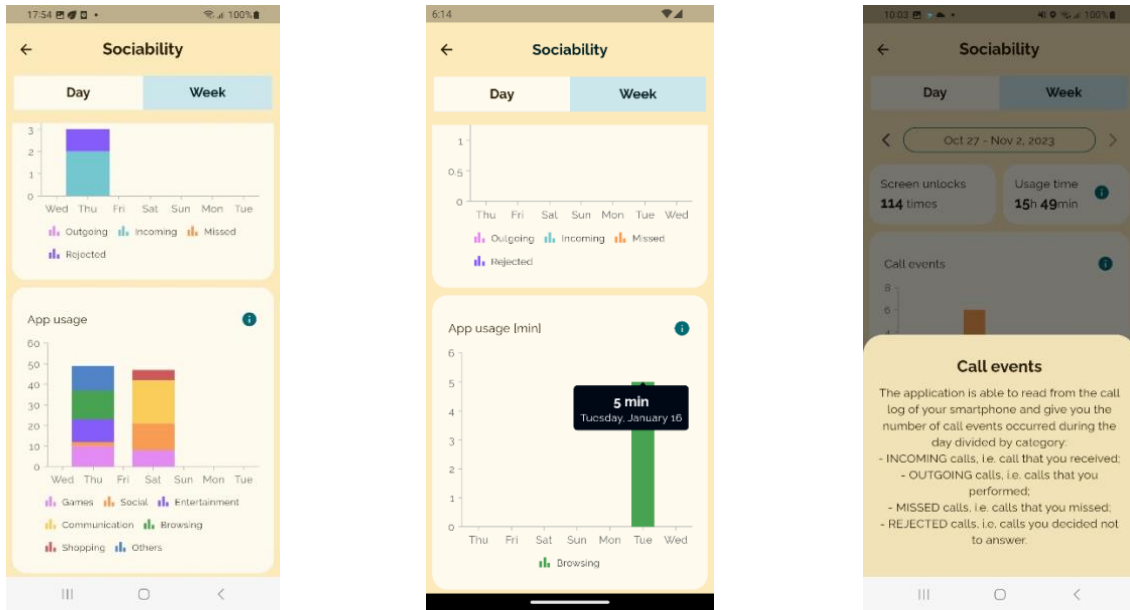


Figure 36: Sociability page

6.3.5 My life tracker

Within the “My life tracker” page, the scores provided to the questionnaire are displayed on a daily base (Figure 37). On top of the page there is a chart showing the trends of MLT scores over time. The plot is interactive and shows a total score of quality of life (trend line) computed as the average of the five scores related to specific aspects of life (general wellbeing, day to day activities...) plus the singular scores identified as colored points on plot. Both the total and single scores can be enabled or disabled on plot to increase the readability of the same. The plot shows five items at the time (starting from the last five) with an indication of the time just below the plot. It can be navigated back and forth using the left and right arrows.

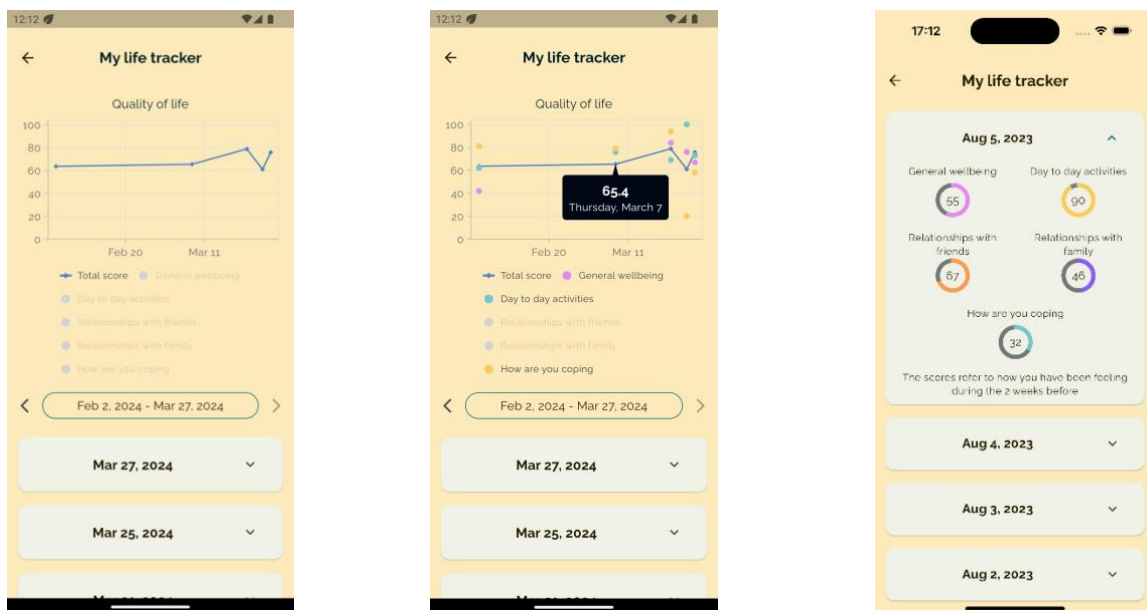


Figure 37: My life tracker visualization page

Below the plot, there are cards for each date on which you performed the questionnaire. These cards can be expanded by tapping on them and display five circles showing the value assigned to each of the five questions are displayed.

New data can be loaded by both going back in time with the left arrow or scrolling down the list of cards.

6.3.6 My feelings

Within the “My feelings” page, the data describing the audio recording of the My feelings activity are presented (Figure 38). In the upper part of the screen, it is possible to play the main frequency of the speech acquired in each date, which is like your voice tone. The dates are linked to produce your own audio. Also, for each date, tapping on the date card, it is possible to display the main acoustic parameters of the selected speech, such as recording duration in seconds, percentage of time spent taking and harmonic to noise ratio in decibels.

To load more data, you can simply scroll down the page and previous cards will appear.

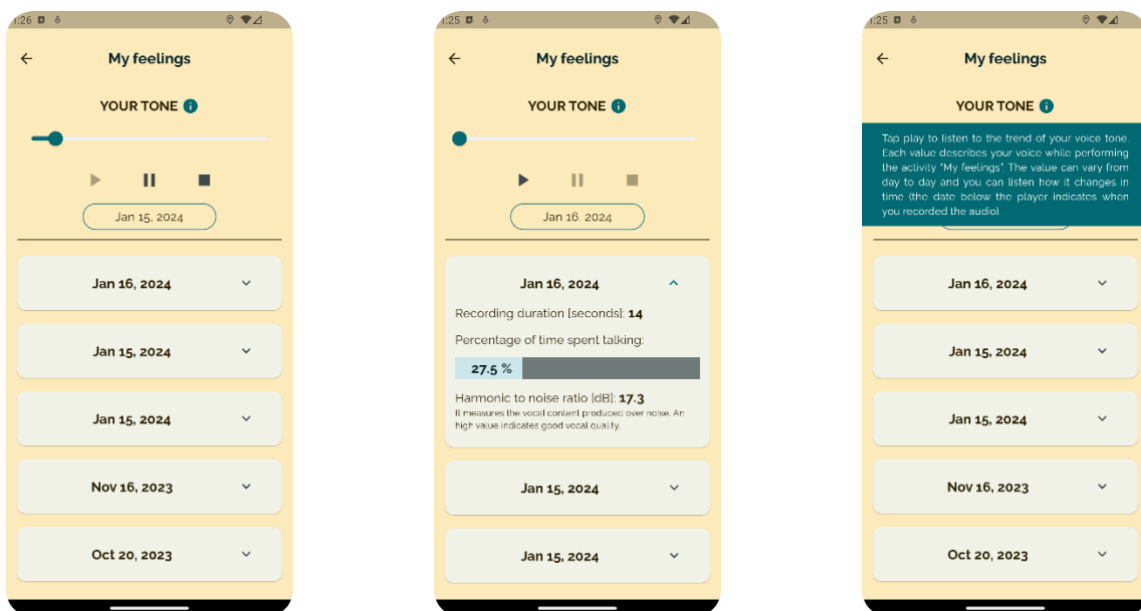


Figure 38: My feelings visualization page

6.3.7 My thoughts

Within the “My thoughts” page, the data describing the text typed in each date when the My thoughts activity has been performed are graphically displayed in the upper part of the screen (Figure 39). The displayed data are the time between key pressions in seconds, the number of stops, the session duration, and the number of words. By tapping on the left and right arrows below the graph, you may navigate the different days. By tapping on the up/down arrow you can switch the data presentation from an expanded to a more condensed view, and vice versa. Below there is a card for each date of activity performed, which can be scrolled and tapped to expand and display the chosen question and typed answer.

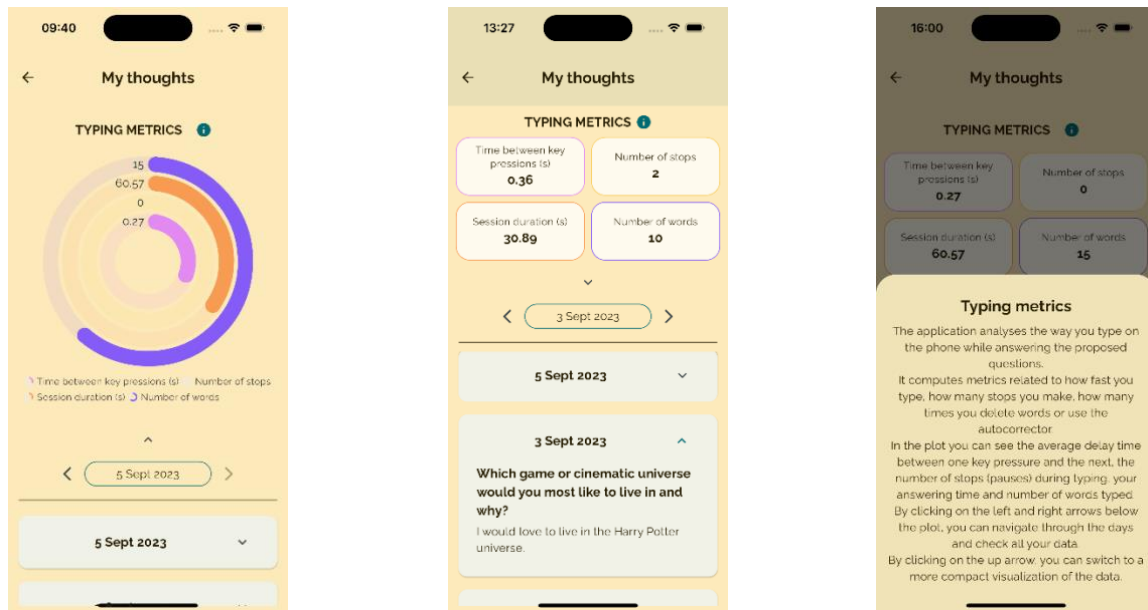


Figure 39: My thoughts visualization page. Left – expanded view. Middle – condensed view. Right – explanation popup.

7. Support functions

NOTICE: this section is intended for the young user and describes additional functions implemented in the application to support the application usage.

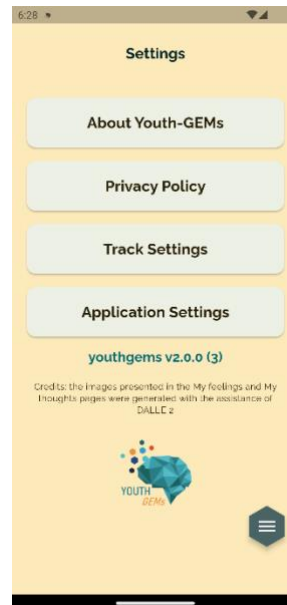


Figure 40: Settings page

The Settings page (Figure 40) allows you to manage all the miscellaneous functions of the applications (check the project description and privacy policy pages, manage the sensors and application settings). It provides information on the application version.

7.1 About Youth-GEMS

This page provides a general description of the Youth-GEMS project and the aims of the Youth-GEMS application (Figure 41).

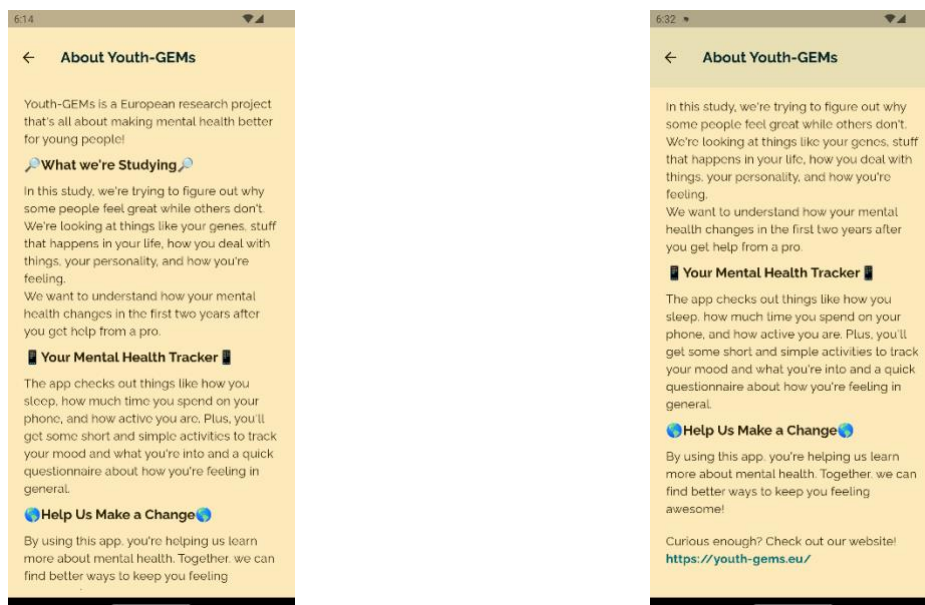


Figure 41: Youth-GEMS project description page

7.2 Privacy policy

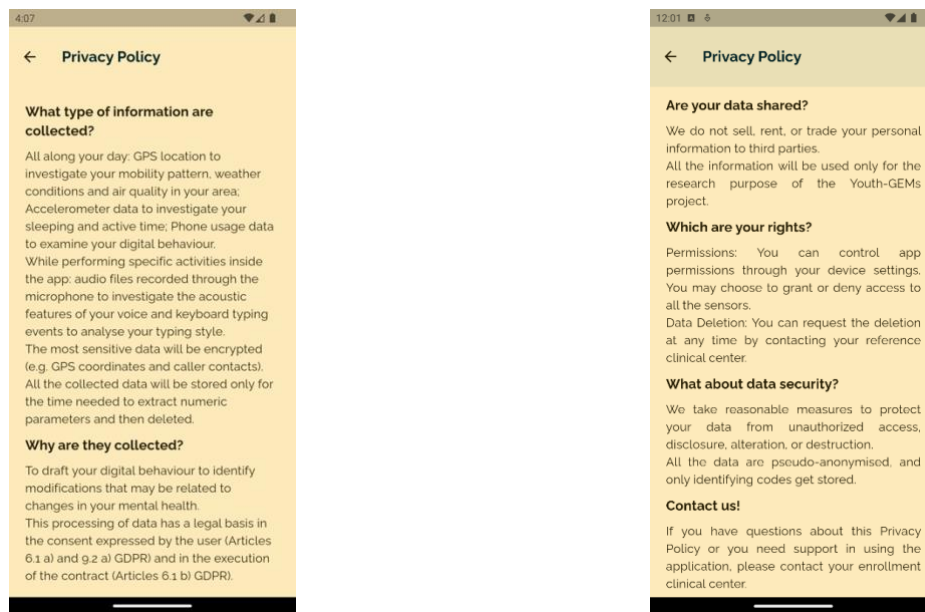


Figure 42: Privacy policy page

This page enables you to always check the privacy policy of the application to which you have agree on during the first access.

7.3 Track Settings

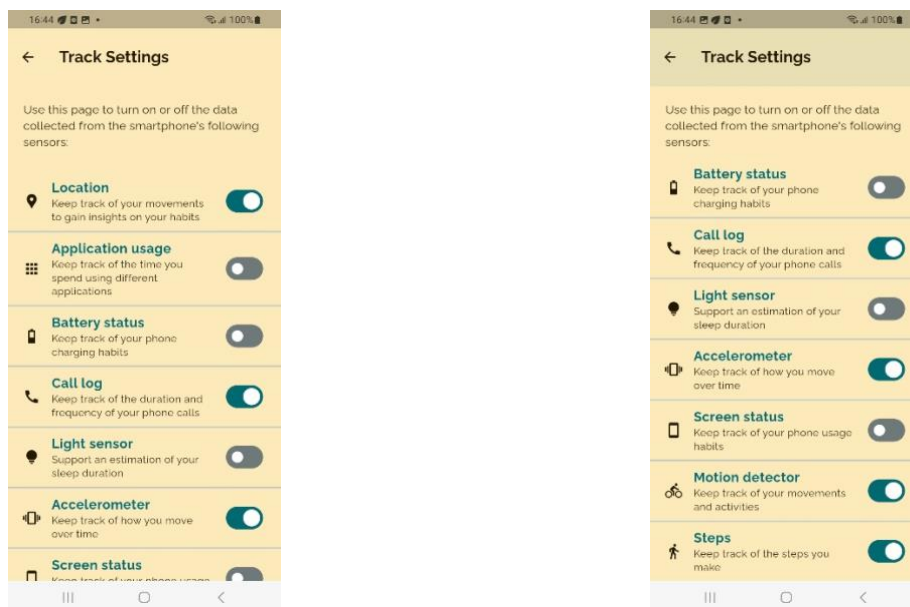


Figure 43: Track Settings page

On this page you can manage data collection inside the application by turning on and off each specific sensor (Figure 43).

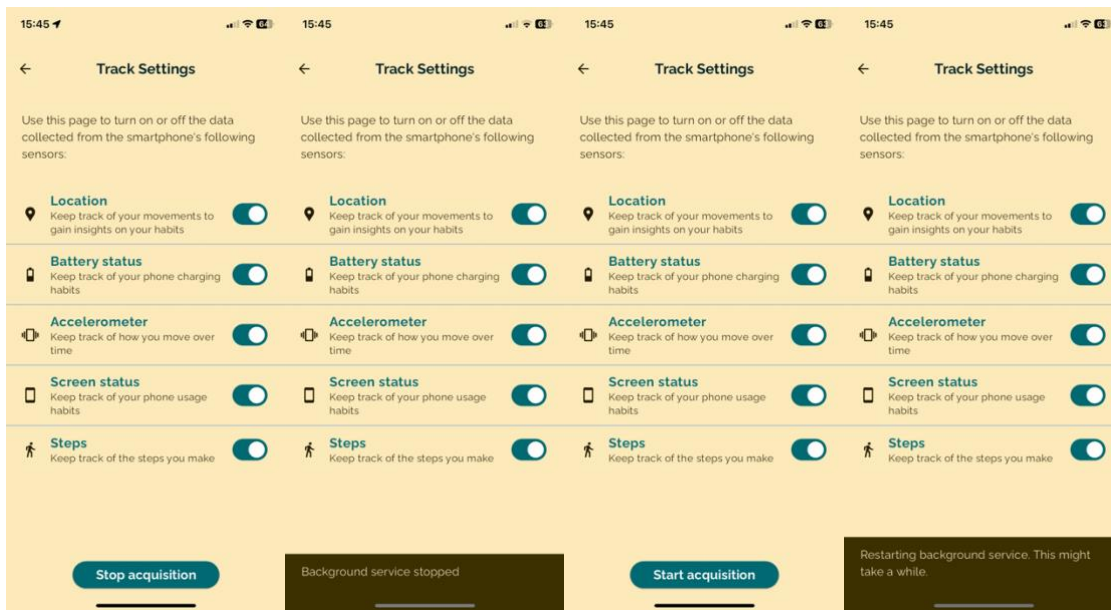


Figure 44: Track Settings page with button to start/stop acquisition and messages informing about the background service status.

Alternatively, you can decide to stop all data collection by tapping on the button “Stop acquisition” (Figure 44). A message will appear informing you that the service has been stopped. You can continue navigating the app afterwards and you can decide at any time to restart the data collection by tapping on the same button that is now “Start acquisition”. Another message will inform you that the service is restarting, and it might take a while.

In case you are collecting additional data from wearables, you can also turn on and off their sharing through Apple Health and Google Health Connect (Figure 45).

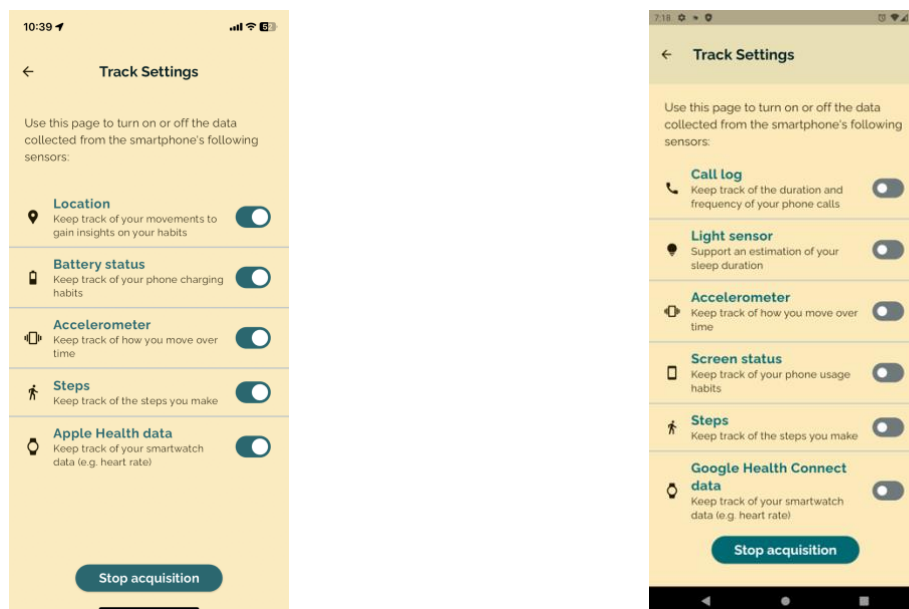


Figure 45: Track Settings page with wearables extra data collection.

7.4 Application Settings

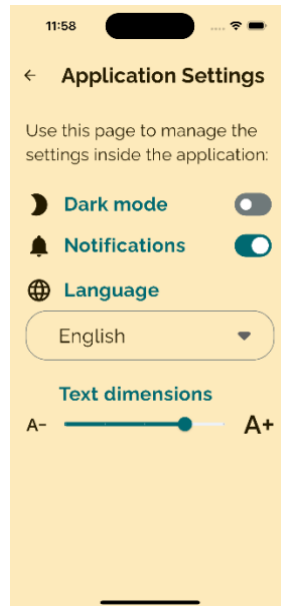


Figure 46: Application Settings page

On this page you can manage specific settings of the application. Here you can change the language of the application (seven languages are currently available, which are English, Spanish, Dutch, Finnish, Croatian, Estonian and Serbian), turn on and off the reminder notifications for the “My Life Tracker” activity, enable the dark mode and decrease/increase the font dimension (Figure 46).

8. Background data collection

8.1 Data collection on the Youth-GEMs mobile app

The Youth-GEMs application is designed to acquire continuously data from the embedded sensors of the smartphone (e.g. accelerometer, GPS, ...) as well as from the phone usage registers (e.g. performed calls, used applications). The acquisition of these data can run when the application is in the foreground (i.e. the application user interface is on, and you can interact with it) as well as when it is in the background (i.e. the application is not active).

For all Android users and iOS users that have the latest OS versions installed (17+) and have provided location permission “Always” in the settings, the data collection can continue to run even when the Youth-GEMs application is swiped (i.e. no longer visible).

On Android smartphones, you can check if the data collection is running by searching for the Youth-GEMs icon in the left part of the phone status bar. If you open the notification center, you can see a permanent notification with the text “App is running a foreground service to collect data from sensors” (see Figure 47). To have a data collection which is suitable for the study purposes, you should periodically check that the data collection is running and, if not, restart the application. On iOS smartphones, instead, you can monitor if data collection is running by searching for the location pin in the left part of the phone status bar.

NOTE: Data collection can work properly only if location permission has been granted.

If permission has been granted with the “When in use” permission level, the data collection will be running only if the application is either in the foreground or background states (see above).

If permission has been granted with the “Always” permission level (and OS version is 17+), the data collection will be running even with the application closed every time the user moves the phone (it detects phone motion and resume the data collection).

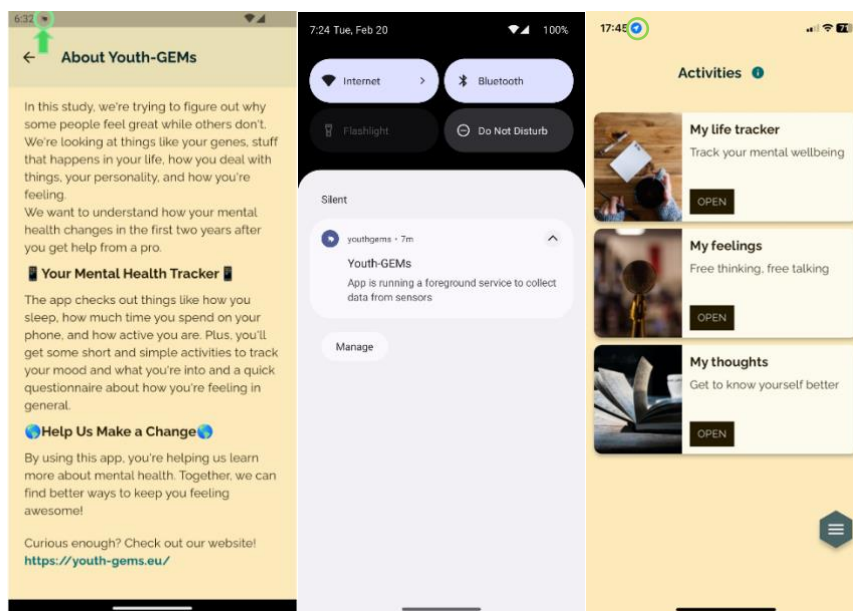


Figure 47: Background service monitoring. Left – Android project icon. Middle – Android permanent notification. Right – iOS location pin.

8.2 Data collection on the Youth-GEMs Wear app

Each data acquisition session on the Wear OS device can run for a limited hours amount. After this period, the app will automatically stop the session and send you a notification indicating that the service has ended (Figure 48). You can simply tap this notification if you wish to start a new session.

This automatic stop is in place to ensure smooth operation and battery efficiency. You don't need to take any action unless you want to continue tracking — in that case, just tap the notification or return to the app and tap “Start” again.

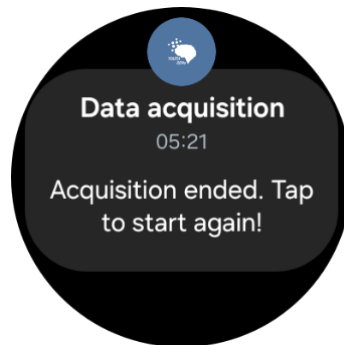


Figure 48: Notification that signal the end of an acquisition session.

While a session is running, the app also provides clear visual feedback (Figure 49) on your watch:

- An ongoing activity indicator will appear directly on your watch face, letting you know at a glance that data collection is active. This helps you stay aware without needing to open the app.
- In the recent apps list, a small chip (or shortcut) will be shown, giving you quick access back to the app while it's running.

These visual cues are automatically managed by the system and are there to make your experience smoother and more intuitive — no need for you to configure anything manually.

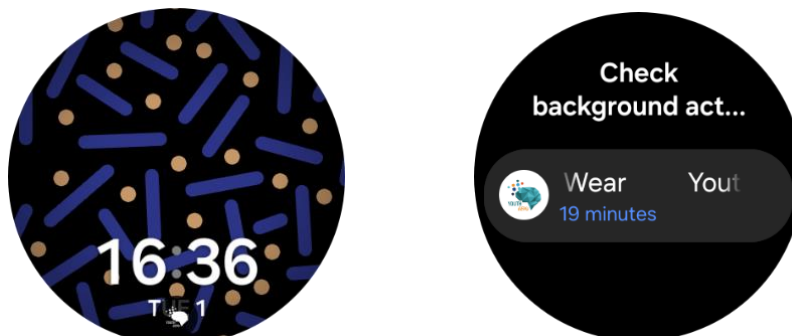


Figure 49: Visual feedback while the session is running.

9. Engagement notifications

9.1 Weekly notifications on the Youth-GEMs mobile app

If you don't interact with the app, the app sends you one notification every two days to remind you to re-open it and allow a smooth data collection. It's important that you tap on it, so that if the data collection was interrupted for any reason, it can restart.

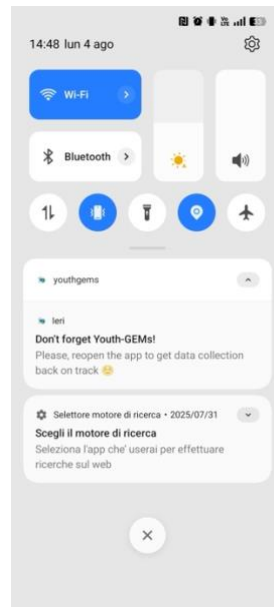


Figure 50: Periodic notification to restart data collection from smartphone's sensors.

9.2 Daily notifications on the Youth-GEMs Wear app

To help you stay consistent, the app sends you one notification per day at your preferred time. You can choose this time by tapping the clock icon on the main screen. The time picker allows you to scroll and select the hour and minute you prefer.

Once set:

- A daily notification will prompt you to start acquisition (Figure 51);
- If acquisition is already running, no notification will appear;
- The first time you receive the notification, it will include a quick instruction message;
- On following days, the message will be simpler.

Tapping the notification will bring you back to the app's main screen, where you can choose to begin a session if it's not already running.



Figure 51: Daily notification prompted to start a new session of data collection.

10. Application termination

To terminate the application, you can either swipe it or (Android only) use the Android back button. In the first case, the application will be terminated but the background data collection will continue to run in the cases described above (see *Background data collection*).

In the second case, because of the importance of the background running of the data acquisition, you are warned to confirm the two subsequent actions: to quit the screen and, if the answer to this first question is “yes”, to stop the background data collection (see Figure 52). If you answer “yes” both to the first and second question, the data collection gets terminated along with the application.

For the iOS cases in which data collection gets stopped on application closed, a notification is sent to ask to re-open the app and keep it in the background.

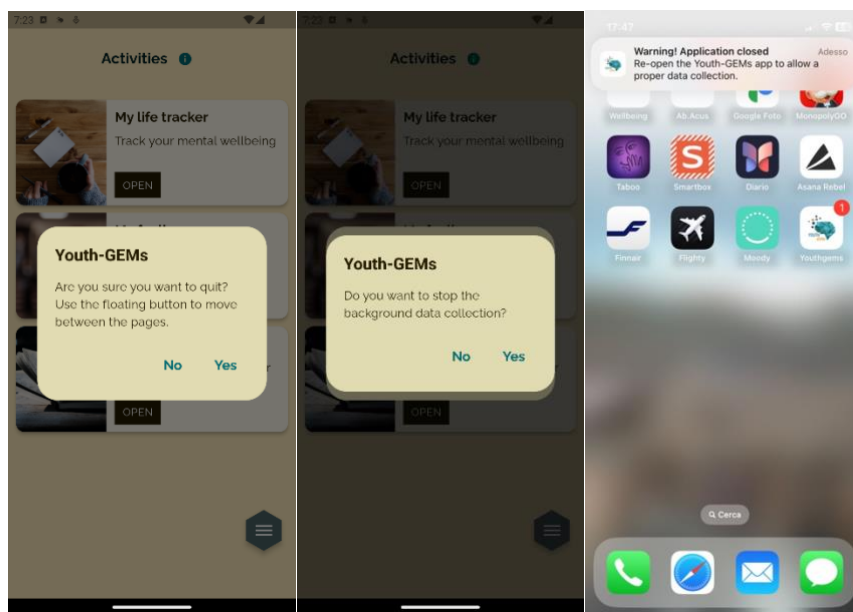


Figure 52: Left and middle – Android pop ups to terminate the application and the background service. Right – iOS notification received on app termination.

11. Application update

Whenever a new version of the app gets released, at app start a message appears informing about the new version available and asking to update. It's highly recommended to keep the app updated since new releases include bug fixing and feature enhancements. Tap on the "Update Now" button to trigger app update. In case of iOS device, you will be routed to the App Store page to update app. In case of Android device, an automatic download is started (as in Figure 53).

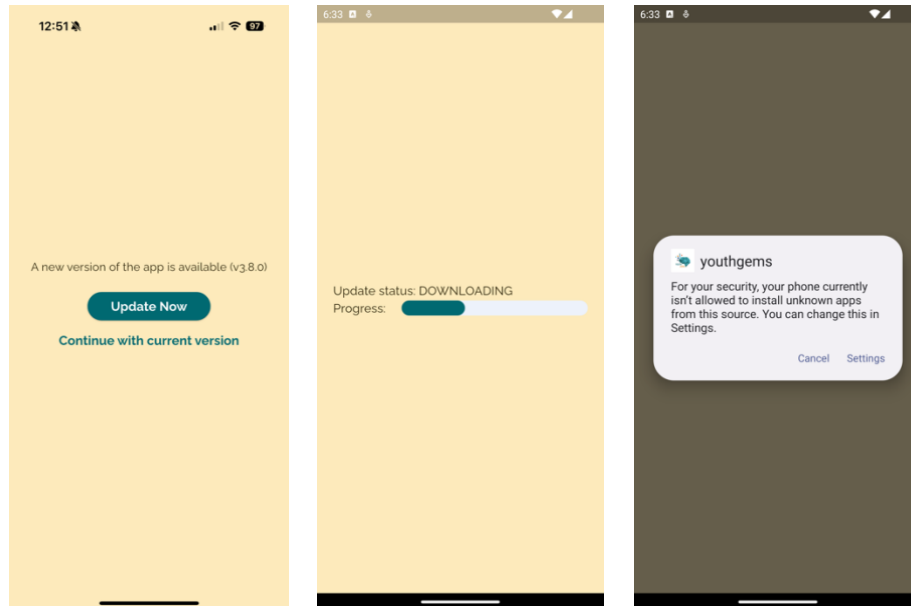


Figure 53: Update app screens.

In case the smartphone doesn't have permission to install unknown apps, a pop up appears asking to go to phone Settings to provide permission. Toggle "Allow from this source" in the Settings screen (Figure 54). Another pop up will appear asking confirmation to update the app. Tap on "update".

If the process completes correctly, a final pop up with "app installed" is shown. If the process has issues, you can tap on "Try again" to re-run it.

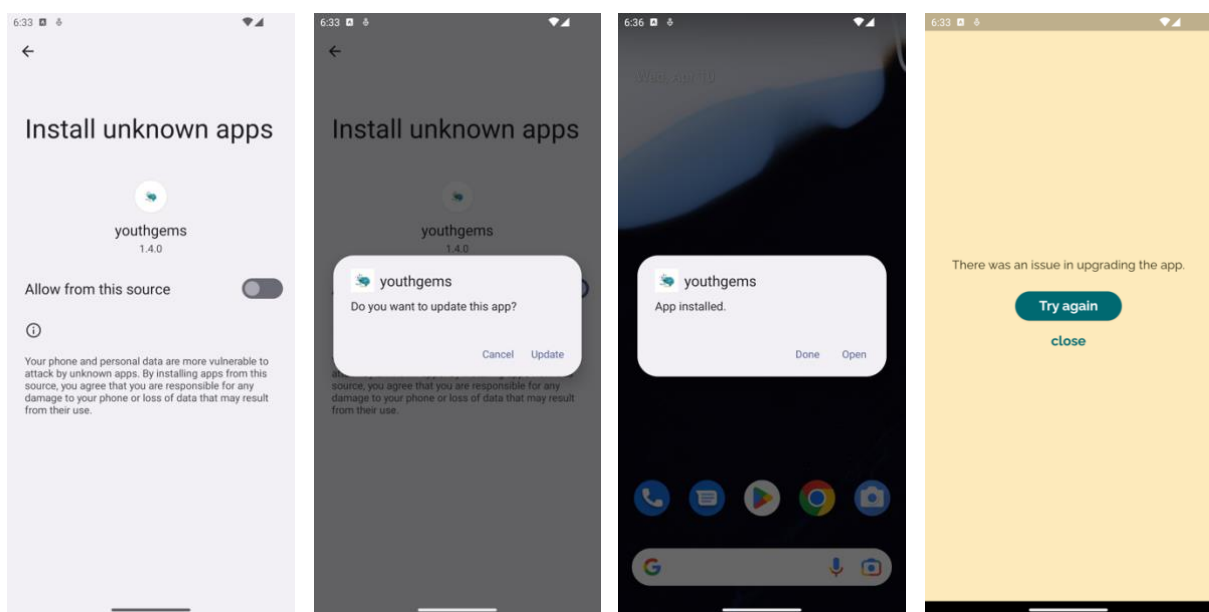


Figure 54: Settings process for app update.

12. Troubleshooting guide

This section addresses the major errors that can limit the usage of the Youth-GEMs system. It includes troubleshooting for software functions.

12.1. Troubleshooting for software functions

This section addresses the main errors that can limit the use of the Youth-GEMs application. It aims to troubleshoot the software functions of the app. For some functions, pop-up windows and warnings will appear when the error occurs, informing the user on what to do. Below is a list of errors identified with the possible causes and probable remedies.

In case none of the indicated actions resolves the problem that you have encountered, please contact your reference research center.

	Description of errors	Possible causes	Probable remedies
1	The application is not launching.	Problem in the app installation.	Restart the device. Update the app to the latest version. Clear app cache and data. If none of this works, uninstall and install the app from scratch.
2	The user cannot access the application.	Problem with the internet connection.	If the phone is connected to a Wi-Fi network, check that the Wi-Fi symbol is present at the top edge of the screen, with at least two bars. If your phone uses a SIM card, there should be a "4G" signal indication. If there is no indicator or other symbol, go to smartphone Settings. If your phone uses Wi-Fi, select "Wi-Fi" in the smartphone settings and check that it is active and connected to the network you want to use. If there is no network indication, check that the router is working. If the network is present in the list of available networks but not selected, select it and, if necessary, enter the relevant password. If, however, your phone uses the SIM card, select "Cellular" in the settings, and check that Cellular data is

			active, the Cellular data option is roaming, and the network provider is the correct one.
3	The user cannot access the application.	The credentials were not entered or are incorrect.	Check your credentials. Reinsert them and log in. Ask your reference research center for the correct credentials.
4	The user cannot access the application.	The credentials have expired.	Credentials correctly expire after 2 years of usage of the system. If that time has not passed, report the issue to your reference research center.
5	The user is unable to perform the My feelings activity.	User did not grant access to the microphone and (Android only) to the call manager.	Provide all required permissions from the dedicated pop ups. (Android only) Go to the phone Settings and search for the Youth-GEMs app. Under Permissions search if microphone and call logs permissions are allowed. If not, tap on them and allow them.
6	The user is unable to send the results of one activity.	Problem with the internet connection.	Check solution described at row 2 of the table.
7	A card is greyed in the Tracking section.	User decided not to track that data.	Tap on the card and enable data collection by providing permissions from the dedicated popups.
8	There are no data shown in tracking section for a specific data type.	Data have not been properly collected.	If you just enabled a data collection, you need to wait a couple of hours before data are shown. Check if related data collection is turned on in Track settings. Check if background service is properly running (Android permanent notification or iOS location pin).