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mHEALTH-AD

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mHEALTH-AD

# Training program for enhancing the adoption of mobile health technologies by persons with mild-dementia

**HANDBOOK MODULE 1: mHealth for monitoring health indicators**

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# INTRODUCTION

## What is mHealth?

The term mHealth describes the use of mobile information and communication technologies (primarily smartphones) in healthcare and health promotion. For this, mHealth applications offer the possibility of long-term documentation of one's own behaviour and health indicators. There are a lot of mHealth applications available, which offer numerous possibilities to support healthcare or health promotion, and the range of mhealth applications is in a constant state of growth. Examples are monitoring apps for tracking vital signs such as heart rate, blood glucose level, blood pressure, or body temperature, which connect the smartphone to external devices (e.g. blood glucose meters, heart rate monitors) by using Bluetooth. Other mHealth technologies can be named as “Wearables”, like Smartwatches or Fitness wristbands, which are predominantly used together with smartphones (Rossmann and Körner, 2016). The term mHealth also includes personal guidance systems, health information and medication reminders (WHO, 2012). To summarise the function of mHealth-technologies, these technologies allow the continuous collection as well as communication and visualisation of health indicators(HCM, 2019).

## Which health indicators (physiological and psychological parameters) are important?

Health indicators in this context are variables of an individual that can be measured and used to describe one or more aspects of a person's health. These variables can help to show and describe changes in the health status.

There are different health indicators which do help to describe one's health status. The most common ones are listed below, and separated into the categories “physically”, “psychologically” and “others”. All these indicators can be tracked with the help of mhealth.

1. physically:
    a. hours of sleep
    b. walking steps
    c. blood pressure
    d. glucose level
    e. body temperature
    f. weight

   g. heart rate

2. psychologically
   a. mood
   b. sleep quality
3. Others
   a. medication intake
   b. diet
   c. water intake

**CONCEPT**

## Monitoring health indicators

Sometimes fears, anxieties and inhibitions lead to a non-use of digital technologies. Because of this, this chapter begins with possible anxieties, their reasons and some further information for the participants.

Fears, inhibitions and anxieties:

Before the process of monitoring health indicators is described, fears, inhibitions and anxieties should be discussed. Participants should feel comfortable and an open atmosphere should be created. Please collect the reasons why participants are not using the technologies. Possible reasons for not using mHealth technologies are:

- They have never heard of such technologies
- They do not have any idea how useful mHealth technologies can be
- Lack of digital skills
- Fear of data misuse
- Etc…

In the following we will explain some answers and explanations to possible reasons. The first reason could be explained as follows: mHealth technologies are still a fairly new field and therefore not yet widespread. That is why they are not yet so well known among people with dementia. The mobile health technology industry has seen a shift from general wellness to clinical disease management. The second reason should have been addressed in the introduction part, where fields of application and advantages are listed. A short repetition of the introduction can be given. The third reason should be addressed in the practical activity. Participants should be told that today they will have the opportunity to try out technologies for themselves and see for themselves that they are not so difficult to use.

Moreover the field of data protection is gaining increased importance among citizens and potential users. mHealth technologies underlie specific data protection regulations. In Europe data protection is a fundamental right in the European Convention on Human Rights. Additionally, the Charter of Fundamental Rights of the European Union expressly enshrines the fundamental right of every person to the protection of personal data. Since 2019, the General Data Protection Regulation applies in all European member states. In principle, the member states are not permitted to limit or reinforce the

Regulation by national regulations. The legislator distinguishes between personal data and sensitive data, which are also personal. The processing of sensitive personal data is prohibited. Since sensitive data also includes biometric data and health data, the consent of the data subject is required. The General Data Protection Regulation also redefines the rights of users In addition to innovations and tightenings, these have been extensively expanded. The data subject has the right for information and to access, to rectification, to erasure, to restrict processing, to data portability, to the right of objection to not be subject to an exclusively automated decision to be subject to an exclusively automated decision.

**Presentation of Use case 1**

Using the example of a smartwatch, a use case for the usefulness of digital technologies for monitoring physiological parameters is introduced below. Smartwatches can improve quality of life and safety for individuals with dementia and their family caregivers. In this case, the focus will be on pulse measurement via the smartwatch. As already mentioned at the beginning of the first chapter, pulse measurement is an important examination to draw conclusions about the frequency and quality of the heartbeat and the circulatory situation.

Our heart beats several times per minute to supply the entire body with blood. A normal pulse is between 60 and 80 beats per minute at rest. Through our breathing, the blood is enriched with oxygen to supply our organs. Through the pumping action of the heart, the oxygen-enriched blood is transported through the vessels into the body. In the process, the blood volume in the vessels changes, depending on the pumping motion of the heart. The blood volume can in turn be measured via smartwatches, and the pulse can be determined via this.

In pulse watches, there are two or more LED lamps and an optical sensor on the back of the watch case. The light from the small lamps passes through the skin and the blood vessels underneath. Depending on the volume of blood in the vessels, the light is absorbed or reflected back. The optical sensor measures whether the light is reflected back or not. This enables the watch to measure a person's pulse.

There are special smartwatches for seniors that have a simplified menu and only display essential information. The icons are then extra large and the contrasts higher so that information can be read more easily. There are providers that allow the watch to be connected to the smartphone and the data

to be displayed in an app. This allows people with dementia, but also their relatives, to start the pulse measurement remotely.

There are also so-called SafteyWatches, which have other functions in addition to pulse detection. These watches have an emergency button so that predefined emergency contacts can be called up if necessary. Modern watches also have automatic fall detection, for example, so that emergency contacts are also informed in the event of a fall. Mobility and safety functions, such as step counters and GPS tracking, are often combined in these watches.

When buying a Smartwacth should pay attention to the following: The watch should be made of sturdy material, so that shocks or impacts can not harm. In addition, it should be waterproof, so that it can be worn even when showering and it is not bad if you forget to take it off. It is also particularly important that the battery life is as long as possible, so that the watch does not have to be charged too often.

**Presentation of Use case 2**

In the following a further example to use digital technologies is presented, this is a digital blood glucose measurement system. Currently, there are existing different systems, such as FreeStyle Libre or Dexcom. Especially in the case of diabetes mellitus, it is particularly important that blood glucose is measured regularly. Both hypoglycemia (too little sugar in the blood) and hyperglycemia (too much sugar in the blood) can lead to serious health consequences, such as nausea or loss of consciousness. The normal blood glucose values are 80-140/150 average range / under 200 for elderly (>75 years).

In the digital measurement of blood glucose, a very small sensor is pricked, for example on the upper arm. The sensor is mostly very small and from the size comparable with a 5 cent piece. This sensor is worn permanently for six to ten days and measures the sugar content in the lower fat tissue. The blood glucose is measured automatically every few minutes. A sensor sitting on top of it transmits the data to a smartphone, for example, which displays the current value and progress. If blood glucose is too high or too low, an alarm is sounded.

Especially for people with dementia, digital blood glucose monitoring can be very helpful, as they do not have to remember to measure regularly. In addition, a small blood sample no longer has to be taken several times a day; the sensor is only changed every 6 to 10 days.

The app of FreeStyle Libre, for example, can alert when individually defined blood glucose values are exceeded or undershot. In addition, the blood glucose values can also be shared with doctors via the LibreView function, if desired. Furthermore, the app creates reports on the daily pattern, i.e. how the course of blood glucose values varies over the day.

If the digital blood glucose measurement is to be used for persons with dementia, it should be checked regularly whether the sensor is still seated adequately. It is also recommended that the sensor be connected to the smartphone of a family caregiver and that the family caregiver be informed in the event of an emergency.

**Practical activity**

This session should end with a practical activity. All participants should have the option to try on the smart watch and measure their own heart rate.
The practical session should end by summarising the experiences with the watch: Is it easy to put it on?, Is it easy to read the heart rate? Is it comfortable to wear?. All participants should be asked if their attitude towards mHealth technologies has changed. Participants should be encouraged to talk with their relatives about the options to implement mHealth technologies in their daily living.

Further examples that could be used by the trainer to describe a use case are, activity trackers, apps that provide information about health issues or have functions to document their own behaviour and exchange information with experts.

**Self-Management and Empowerment**

In the last section, an overview of different technologies and the potential benefits was given. In order for the technologies to really become established in everyday life, this chapter will deal with the topic of self-management, especially related to routines.

Besides giving PWD a better overview about their health data and by that creating more security in everyday life, health applications are often designed to help establish routines in using it on daily basis. Therefore, it is important that the PWD get know more about their own self-management and possible routines when dealing with mHealth. First, the concept of self-management is explained in general,

then in relation to PWD. Building on this, it is then explained how the topic is elaborated within the training programme.

Self-management describes the ability to have the resources to shape one's own personal or professional development. It refers to the competence of being able to manage tasks for oneself independently of external influences with the help of various methods and strategies. In general, self-management methods can help to better structure everyday life and establish routines. When dealing with chronic or progressive diseases focusses on the ability to manage symptoms, treatments and lifestyle changes.

Persons with dementia and their relatives could also benefit from such structures. Dementia can already cause changes in daily life at an early stage and while it progresses, PWD are confronted with further challenges regarding health and personal independence. In this context, the topic of self-management and creating useful routines might be relevant for PWD, relatives and caregivers. Here, mHealth solutions can also be a supporting element to strengthen physical and mental health. The concept of self-management should be taken up in the training programme in order to create a practical link to the mHealth technologies presented to underline the relevance for everyday life. Within this activity, patients and caregivers should get a short introduction about the concept of self-management and deal with their personal experiences on the topic. Here, It is important that attention should be paid to appropriate complexity. Many examples should be used and not too many methods should be introduced. For example, the course leader could report from his or her own everyday life which apps helps with self-management individually. Building on the introduction, patients and relatives should consider to what extent they have already integrated certain routines and structures into their everyday lives as a matter of course. They should also reflect on which parts of their everyday life they would like or could use more self-management. Patients and relatives should be equally involved in this topic. The relatives are often the greatest support for PWD. However, this can also be stressful, so that good self-management can also become important for the relatives. After dealing with the current level of self-management, PWD and their relatives will be asked to develop at least one individual self-management routine based on the mHealth technologies they were introduced to in the first part of the programme. Here, it is important to find a routine or strategy that is as realistic and useful in everyday life as much as possible.

Some helpful advice and examples regarding self-management of PWD can be found here:

Supporting self-management: improving 'The Dementia Guide' | Alzheimer's Society (alzheimers.org.uk)

Self-Management and Dementia (brainxchange.ca)

Online Self-Management Workshop for Rural Dementia Caregivers (alzheimers.gov)

## AVAILABLE MHEALTH TECHNOLOGIES

Currently, various technologies are available for monitoring physiological and psychological parameters. Various technologies are used, for example, to monitor blood sugar, heart rate or sleep quality. If you are interested in currently available devices and apps, you can find an overview of selected mHealth technologies in the table provided on our homepage.

## HOME ACTIVITIES

Action 1.1: Please write down all physiological and psychological parameters, that are important four you/ in your daily routine.

Action 1.2: Collect with your relative mHealth solutions that could be useful for you and that are affordable/ available.

Action 1.3: Implement the self-management routine you have developed in Action 1.4 and set a reminder.

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