

# Digital Health: A Web-based Repository with Back School Recommendations and Exercises against Paravertebral Pain (with a Comparative Study of the Opinions of Responders of Different Generations)

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**Abstract.** Digital Health (DH) is a relatively new concept for our country. The current article is oriented to the application of DH technologies for the prevention of paravertebral pain, by a web-based repository. In the repository, we included Back school recommendations, position techniques, exercises, activities, sports, and clinical cases of our own rehabilitation practice.

**Keywords:** Digital Health, Electronic Repository, Rehabilitation, Back Pain, Paravertebral Pain, Back School, Exercises.

## 1 Introduction

### 1.1 Digital Health

Digital Health is the application of Information and Communications Technologies (ICT) in medicine and other health professions to manage diseases and health risks, to promote wellness, to increase the quality of life and the quality of care (Ronquillo Y., Meyers A., Korvek SJ, 2022). Digital health includes the use of wearable devices, mobile health, telehealth, health information technologies, clinical decision support systems, web-based health services, telemedicine and telerehabilitation, electronic health records, electronic prescribing systems, assistive technologies, rehabilitation robotics, augmented and virtual reality (WHO, 2016).

Advantages of digital technology include easy access to information, improved communication, protection of the scientific heritage in the fields of Medicine and Healthcare, and accessibility in education (WHO, 2016).

The principal objectives of digital health are to ameliorate the quality of care and medical services (especially in primary care and acute care services), to improve public health, to increase the experience of medical specialists and health professionals, to

upgrade the health culture of the population (Kujala S., Horhammer I., Kaipio J., Heponiemi T., 2018).

DH tools produce a huge volume of information, used in healthcare for administrative, educational, research, and clinical objectives. The information quality in digital health must have many meaningful dimensions: availability, informativeness, usability, objectivity, integrity, confidentiality, and secure access (Fadahunsi KP, O'Connor S, Akinlua JT et al., 2021).

We apply DH technologies in different medical and para-medical areas: prevention and wellness, diagnosis, therapy, rehabilitation, disease management, prognosis, environmental adaptation, and public health.

Digital health technologies are an important part of medical practice. According to the data of the World Health Organization (WHO, 2016) (WHO, 2019), about 58 % of countries – members of the WHO have some e-Health strategy. The goal is the implementation of e-Health as universal healthcare coverage. For the future development of digital health, an interdisciplinary team is necessary (Woods L., Cummings E., Duff J., Walker K., 2018).

## **1.2 Digital Competencies**

The application of digital health tools requires specific competencies of the members of the medical staff and the population. The basic digital competence areas are “Information and data literacy”, “Communication and collaboration”, “Digital content creation”, “Safety”, and “Problem-solving” (Carretero Gomez S. et al., 2017). According to the document “DigComp 2.1.” of the European Commission, the area of “Information and Data literacy” includes competencies in browsing, searching, and filtering data, information, and digital content; evaluating and managing these data and digital content. The second area of “Communication and Collaboration” contains interacting through digital technologies; sharing information and content, and collaborating through digital technologies. The most important elements of the third area “Digital content creation” are programming and developing digital content. The fourth area “Safety” comprises the protection of devices and personal data, the protection of health and well-being. The fifth area “Problem-solving” includes creatively using digital technologies, solving technical problems, and identifying digital competence gaps.

For the adequate use of Internet resources and digital libraries, many authors consider important learners’ capacities of personalized observation, e-learning experience, critical reading, and critical thinking (Arapi P, Paneva-Marinova D, Pavlov R, Christodoulakis S., 2016) (Paneva-Marinova D, Goynov M, Pavlov R., 2017) (Halkal, Rachmany, E., Nugroho, B.Y.S., et al., 2022).

## **1.3 Digital Competencies and Generations**

Demographic studies define generation names, based on when members of that generation become adults (18-21 y). Generation Z (centennials, iGen) includes people, born during the period 1997-2012, age 11-26 years (in 2023). Millennials (Gen Y) are born in the period 1981-1996, the actual age of 27-42. Gen X includes persons of 43-58 years

old, born between 1965 and 1980. Baby boomers are born between 1946 and 1964 (during this period, there was a statistically significant surge in the number of births, after the end of World War II in 1945).

According to an online publication of 2023 by the company Martech (Karr, 2023), Baby boomers were the pioneers of adopting home computers, but are indisposed on adopting newer technologies, at this period in their lives. Generation X primarily utilized e-mail and mobile phones to communicate. Millennials (or Gen Y) were the first to apply text messaging and social media. Centennials (or Gen Z) utilize firstly handheld communication devices and accessories to communicate; they use the smartphone for messaging apps 57 % of the time.

According to a sociological survey of 2022 by the Pew Research Center (Vogels et al., 2022), Gen Z dominates online searches for information on the post-Millennial generation (in the USA). Teens (gen Z) use currently social media. The most popular online platforms among teens are YouTube, Instagram, Snapchat, Facebook, and Twitter; Tik-Tok has arisen and Facebook usage has dropped since a previous survey of 2014-2015. Smartphones, desktop and laptop computers, and gaming consoles are widely accessible to Gen Z.

There cannot be identified any searches regarding the current topic in our country.

#### **1.4 Paravertebral Pain – Rehabilitation Algorithm**

Paravertebral pain is a frequent symptom in everyday rehabilitation clinical practice. Some authors consider that every person has visited a medical specialist or health professional for paravertebral pain, at least once during his life.

In clinical practice, we apply a strong algorithm for back pain: analysis of patient complaints, clinical exams, neuro-imagery, neuro-functional investigations, functional assessment, diagnosis, prescription of medications, and functional therapy (Koleva, 2019) (Koleva I & Avramescu T Editors, 2017). The rehabilitation program includes a synergic combination of different procedures: physiotherapy, occupational therapy, electrotherapy, magnetotherapy, lasertherapy, balneotherapy, peloidotherapy, etc. (Koleva I, Krastev N, Yoshinov R, 2015) (Koleva I, Yoshinov RD, Yoshinov B, 2018) (Koleva I, Yoshinov B, Yoshinov R, 2018).

In some patients, back pain is due to a disease, in other cases – it is a consequence of physical inactivity, vicious position, or muscle imbalance. Therefore, standard recommendations can be useful for many people. This was our motivation for developing a repository with physical exercises and activities, oriented to the reduction of this unpleasant sensation.

## **2 Exposition of the Investigation**

### **2.1 Objectives and Phases of the Investigation**

Our principal goal was to create a digitalized repository for patients with back pain, after their visit to a medical doctor for diagnosis and orientation to rehabilitation.

The main phases were: analysis of the literature, organization of the major parts and subsections of the repository, presentation of the repository to potential users (medical specialists, health professionals, students, patients), creation of a questionnaire, and analysis of users' opinions (Figure 1).

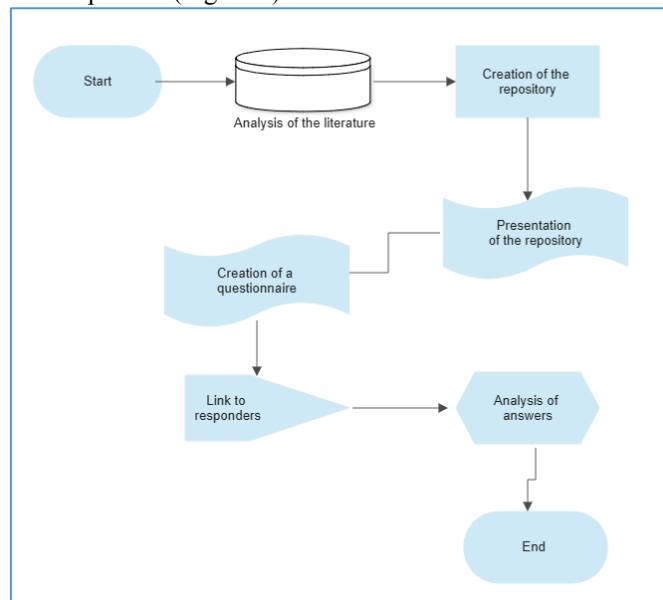


Fig. 1. Algorithm of the investigation.

## 2.2 Structure of the Electronic Repository

The structure of the e-repository includes three principal levels: patient complaints, investigations, and treatment (drugs, vitamins, exercises) (Figure 2).

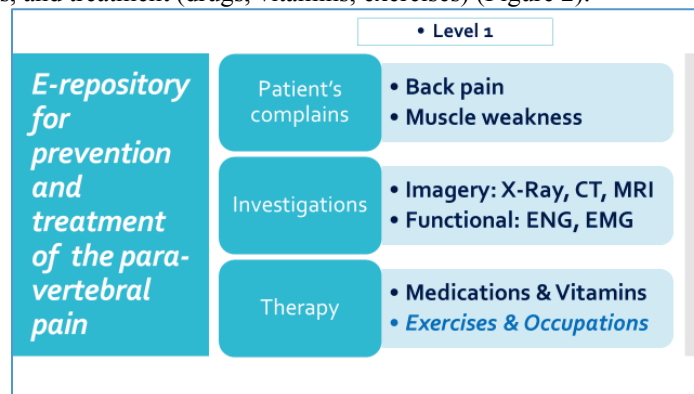


Fig. 2. Principal elements of the e-repository.

The most important level is the module with recommendations of the Physical and Rehabilitation Medicine (PRM), including Back school prescriptions, exercises and activities, and preformed physical factors (Figure 3). The recommendations of the Back School emphasize some positions of the trunk during different activities and sports. The part “Physical therapy and Occupational therapy” comprises trunk movements in flexion (Williams’ exercises) and extension (Superman exercise and variants), muscle belt training, exercises for the pelvic sphincters (Kegels), and soft tissue techniques (post-isometric relaxation /PIR/, stretching of the lumbar fascia, manual therapy, massages).

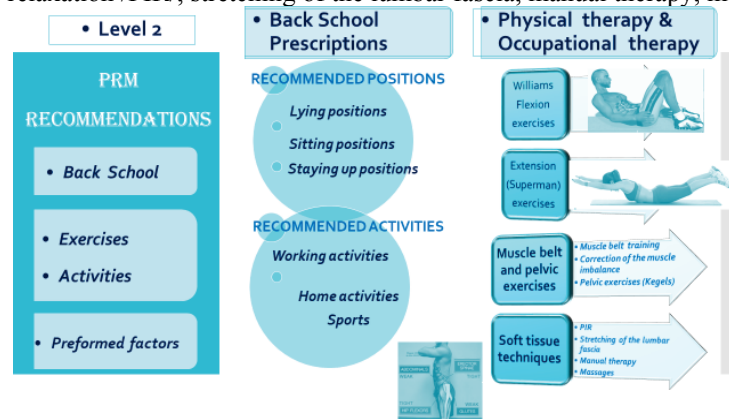


Fig. 3. Elements of the second level.

Patients, under supervision, can use these two levels of the repository (partially). The next part (level 3) is intended only for medical specialists and health professionals. Here we incorporated some typical and rare clinical cases. An illustration is presented on the next Figure 4: This is a case report of discal hernias on several levels, without stenosis of the spinal canal.



Fig. 4. Example: a typical case report.

### 2.3 Investigation of the Usefulness of the Repository

Last year (2022), we presented the repository to some members of the multi-disciplinary rehabilitation team: medical specialists, health professionals, patients, and students. We sent a brief anonymous questionnaire to 126 participants and we received 119 completely filled protocols (94.44%). Figure 5 presents the distribution of questionnaires by profession and the flowchart with the difference in answers (we lost 7 answers of 4 medical doctors and 3 physiotherapists).

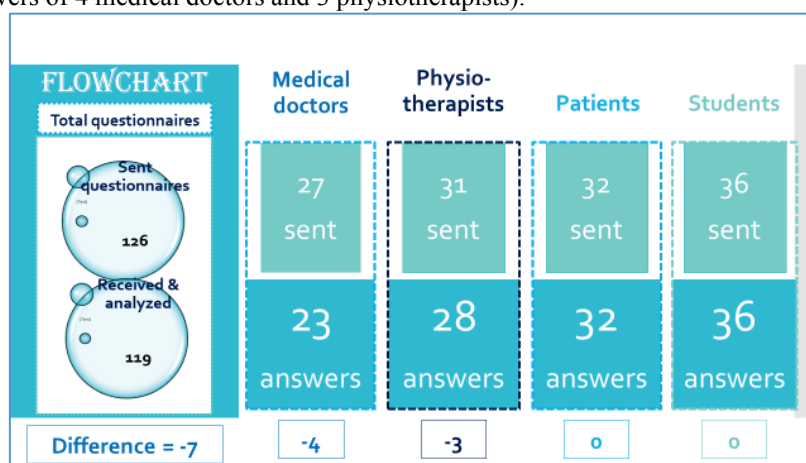


Fig. 5. Flowchart of the questionnaires.

## 3 Analysis of the Results of the Questionnaires

The questionnaires were sent via email to responders. We requested the answers in a period of one week.

In the survey, we included questions concerning the profession, sex, age, and clinical experience (in years).

We asked the opinion of responders about the theoretical and practical usefulness of the repository. For this, we applied a Likert 7-levels scale with possible answers: strongly negative, negative, maybe negative, indifferent, maybe positive, positive, and strongly positive.

The other important question was if the e-repository is easy to use. For a description of the difficulty to use the program, we proposed seven possible answers: very difficult, difficult, maybe difficult, indifferent, maybe easy, easy, and very easy.

### 3.1 Opinion on the Usefulness of the e-Repository

All received and fully completed questionnaires (n=119) expressed a positive or strongly positive opinion. The exact result is, as follows: 94 responders (78.99 %) declared a strongly positive opinion, and the rest of the responders declared a positive opinion (25 answers, 21.01 %). No other types of answers.

### 3.2 Opinion Concerning the Difficulty to Use the e-Repository

Most of the responders consider the e-repository easy to use. But 27 of the participants (22,69 %) have some difficulty with the electronic version. One interesting fact for us: all these responders have aged from 50 to 69 years old (generation X and Baby boomers). Therefore, we decided to realize a comparison of these results by age.

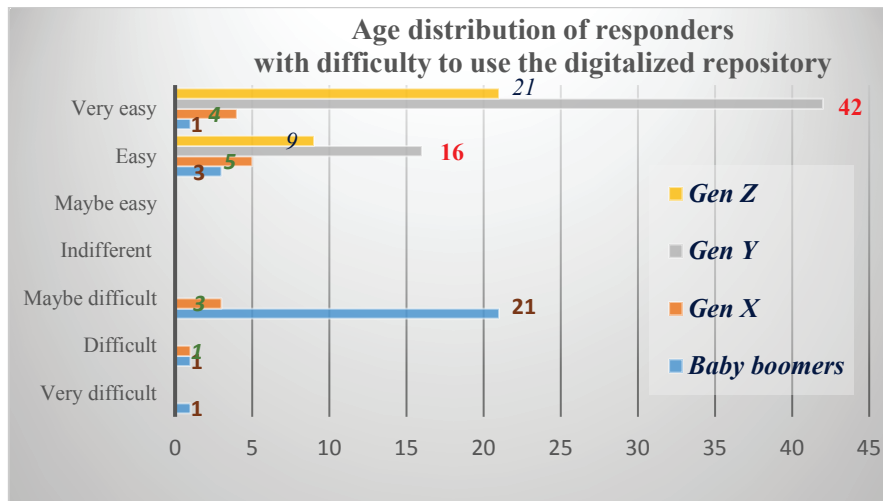
### 3.3 Comparison of the Opinions of Responders of Different Generations

The next table (№ 1) and next figure (№ 6) present the distribution of answers concerning the difficulty to use the digitalized repository – by age (generation). In our group of responders, we do not observe significant differences by sex.

**Table 1.** Age distribution of the answers on the difficulty to use the digital repository.

<b>Difficulty to use</b>	<b>Baby boomers</b>	<b>Gen X</b>	<b>Millennials (Gen Y)</b>	<b>Gen Z</b>	<b>Total</b>
<i>Very difficult</i>	1	0	0	0	1
<i>Difficult</i>	1	1	0	0	2
<i>Maybe difficult</i>	21	3	0	0	24
<i>Indifferent</i>	0	0	0	0	0
<i>Maybe easy</i>	0	0	0	0	0
<i>Easy</i>	3	5	16	9	33
<i>Very easy</i>	1	4	42	12	59
<b>Total</b>	<b>27</b>	<b>13</b>	<b>58</b>	<b>21</b>	<b>119</b>

In figure 6, we can perceive that all answers containing difficulty (*very difficult, difficult, and maybe difficult*) are done by the representatives of the “old” generations (Baby boomers and some of Gen X). Moreover, all answers of the group “Easy” (easy and very easy) are from the groups of “young” generations (Gen Y, and Gen Z /iGen/).



**Fig. 6.** Age distribution of the responders with difficulty to use the digitalized repository.

#### 4 Discussion and Conclusion

The created repository can be useful for medical specialists, health professionals, and patients suffering from back pain. The majority of responders consider the digitalized version easy to use, especially those from generations Y and Z. However, representatives of the generation of Baby Boomers and a few from Gen X, may present some difficulties with the digitalized version; they prefer another form, e.g. printed version.

If we apply the classic SWOT analysis of the elaborated repository, we can say some Strengths and Opportunities. Paravertebral pain is a frequent condition and can be useful for professionals, and for patients, including for the education of students and trainees, and during the process of long-life-learning of the rehabilitation team. The digitalized version is easy-to-use for younger generations. The repository is open and can be amplified and developed, according to the necessities of the members of the interdisciplinary multi-professional rehabilitation team. However, we note some Weaknesses and Threats. Not every back pain can be treated by physical modalities and a preliminary diagnosis and concretization of the therapy by a medical doctor is necessary.

Nevertheless, we consider that our repository has significant practical benefits and we included it in the process of vocational training of rehabilitation professionals.

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